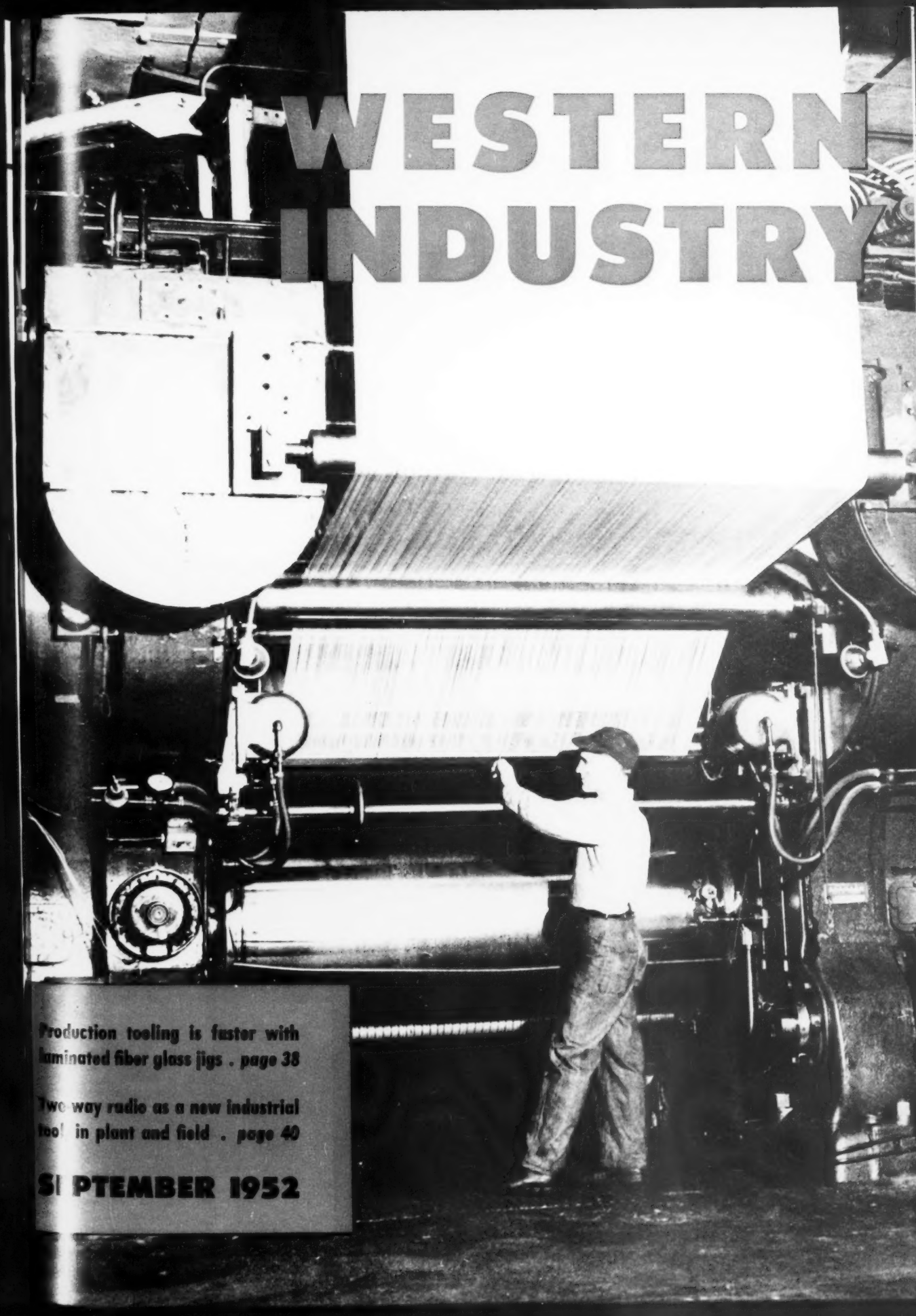
WESTERN INDUSTRY



Production tooling is faster with laminated fiber glass jigs . *page 38*

Two way radio as a new industrial tool in plant and field . *page 40*

SEPTEMBER 1952

Cabco engineers constantly test, test, test. No custom tailor is more critical of size, fit, strength.

You get more from CABCO

...the West's foremost designer and manufacturer of wooden shipping containers

The unseen extra ingredient in a Cabco container is the skilled engineering that goes into its manufacture. Every day, you'll find Cabco engineers in the fields, factories and shipping docks, getting first-hand information on what users want a shipping container to do. Every part of a Cabco wirebound is painstakingly engineered for better fit, better closing, easy handling, snug carloading, utmost protection. You can always count on Cabco to give you *more!*

STOVES, TOO, MOVE IN CABCO quality-built wirebound containers. Special Cabco open-type design wraps quickly, easily around new ranges, speeds packing, makes for easy handling. "Flex" feature of Cabco wirebounds absorbs travel shocks, helps prevent damage. Open design permits ready identification of contents. Users save both on container cost and on freight.

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CABCO

A product of the California Barrel Company, Ltd.

B.F. Goodrich

industrial tires save with every turn of the wheel

Extra-heavy loads to handle?

Use hand trucks?

Do you have maneuverability problems?

Know how to save on trailer tires?

Which is best? Pneumatics? Solids? Semi-pneumatics?

Problems with greasy floors—unusual loads?

Free TW TIRE AND WHEEL ANALYSIS may save you up to 50%

• No matter what materials handling problems you have involving tires and wheels, you can get expert advice and assistance that will save you money. Under the B. F. Goodrich T&W (tire and wheel) Analysis Plan, a man trained in this work analyzes your operation. He carefully notes the type of equipment, loads, speeds, hauling surfaces and any unusual problems involved. Then he makes recommendations as to the right type, size, tread compound and tread design best suited for your job. He makes suggestions on maintenance.

Because B. F. Goodrich makes a *complete* line of tires—solids, pneumatics and semi-pneumatics—and offers a wide range of tread designs and compounds, his advice is impartial—unbiased.

Why not take advantage of this service without any obligation? Send in the coupon or call your B. F. Goodrich dealer. BFG dealers sell and service a complete line of industrial tires.

A special T&W Analysis Plan is available for manufacturers of industrial hauling equipment.

The B. F. Goodrich Co.
Department TW-200
Akron, Ohio

Please give me additional information on your new Tire and Wheel Analysis plan.

Name_____

Title_____

Company_____

City_____ State_____

WESTERN INDUSTRY

VOLUME XVII SEPTEMBER • 1952 NUMBER 9

ARTICLES

DEPARTMENTS

FRONT COVER

Hundreds of weftless rayon cords go into giant calendar at B. F. Goodrich plant in Los Angeles to be coated evenly with rubber and emerge as tire plies. Bias cutting later makes each ply the right width to go into shock resistant tires.

Published Monthly by
KING PUBLICATIONS
609 Mission Street
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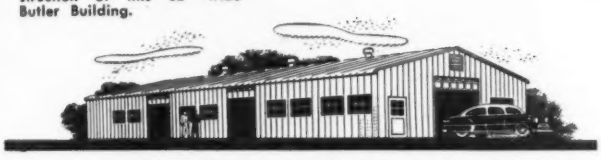
What Size Building Do You Need?

Butler Packaged Buildings like this one meet a wide variety of industrial needs—at low cost.

There's a
BUTLER BUILDING
(STEEL or ALUMINUM)
to Fit
Your Requirements

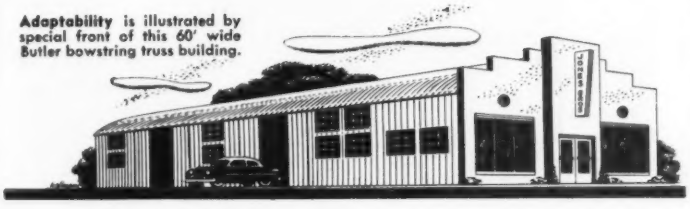
Maximum usable space is assured by rigid frame construction of this 32' wide Butler Building.



Yes, low cost, fire-safe, adaptable Butler Steel Buildings answer your need for variations in width, length, height. And Butler straight sidewalls and truss-clear, column-free construction assure full usable space.

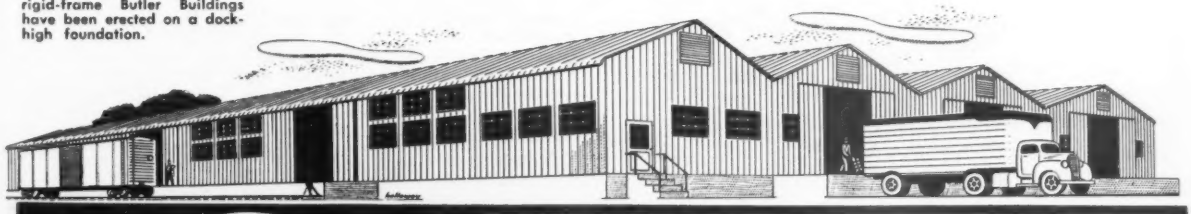
Butler Steel Buildings are made at our Richmond, Calif., plant, for convenient delivery to West Coast industry. In days instead of weeks, your Butler Building can be ready for long-life use. For a Butler Steel Building to fit *your* needs, see your Butler dealer or mail this coupon today.

Adaptability is illustrated by special front of this 60' wide Butler bowstring truss building.



Straight Sidewalls . . . Use All the Space You Pay For

Plenty of space to meet any requirement can be provided by multiple-unit installations of Butler Buildings. Here, four rigid-frame Butler Buildings have been erected on a dock-high foundation.



BUTLER STEEL PRODUCTS

BUTLER MANUFACTURING COMPANY
KANSAS CITY, MISSOURI
Galesburg, Illinois
Richmond, California
Birmingham, Alabama
Minneapolis, Minnesota

For prompt reply, address
Butler Manufacturing Company
Dept. 72A, Richmond, California

☐ Send full information about Butler Steel Buildings, for use as _____

☐ Send name of my nearest Butler dealer.

Name _____

Firm _____

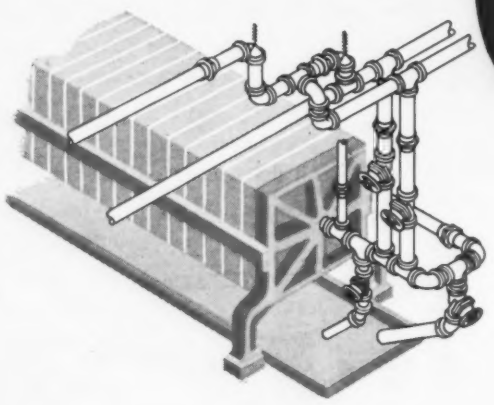
Address _____

City _____ **Zone** ____ **State** _____

This CRANE VALVE sharply reduced maintenance costs

Here was a case of unusual and severe service for valves. The gritty, erosive fluid demanded replacements at an alarming rate. Then, by installing an exclusive Crane design, valve costs were cut far beyond the customer's expectations. Here was a specialized need, but just as in ordinary valve needs, the complete Crane line supplied a suitable, dependable selection.

Read these Facts of the Case!



Where Installed: In a pottery, controlling the flow of liquid clay at 140 pounds pressure, to filter presses for refining.

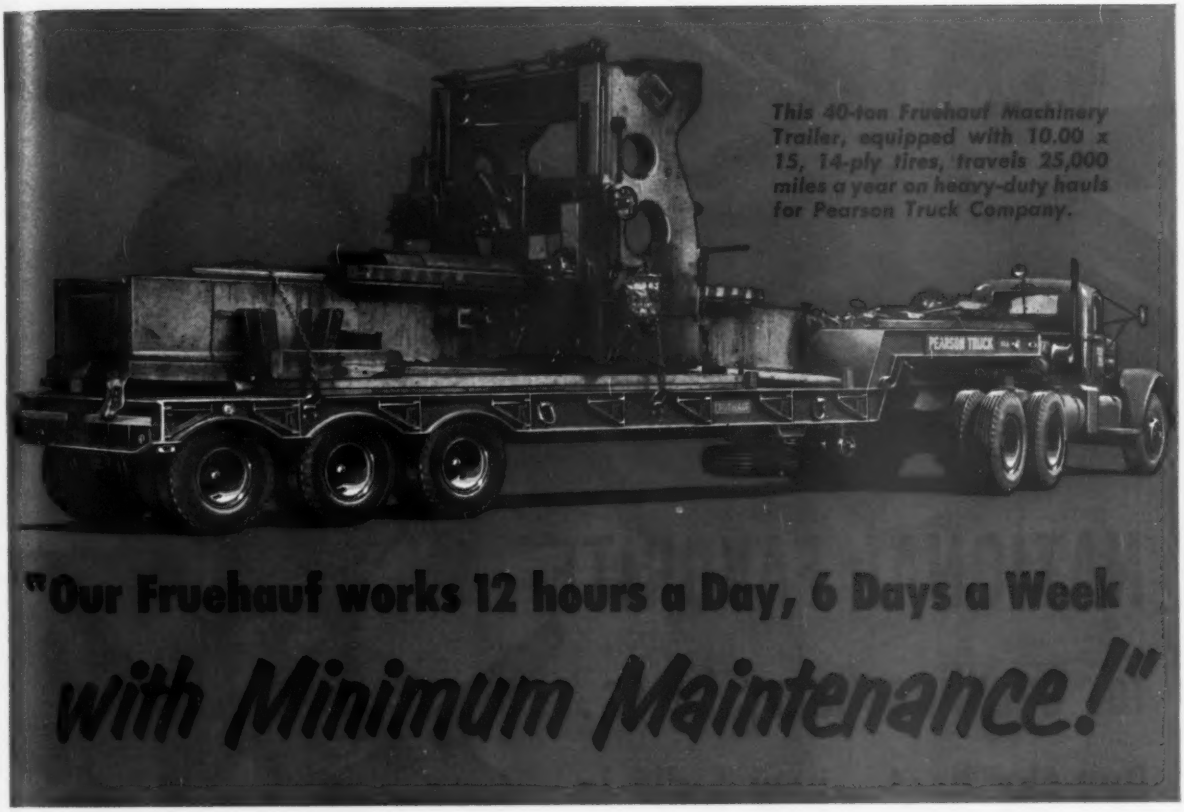
Trouble Encountered: Other type valves formerly used had to be replaced every 2 to 8 weeks because of leakage. The gritty liquid clay under pressure, literally ate away the valves' parts that shut off flow.

Solution and Result: Crane Iron Body Diaphragm Valves were installed. After 11 months' uninterrupted service, they showed no wear, no damage. Maintenance cost—zero. Satisfaction—100%.

More CRANE VALVES *are used than any other make*

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5 • Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



"Our Fruehauf works 12 hours a Day, 6 Days a Week with Minimum Maintenance!"

Says **A. R. PEARSON,** *President*
Pearson Truck Co., Los Angeles, Cal.

"MACHINERY AND MACHINE TOOL HAULING puts equipment through a tough workout. Our 40-ton Fruehauf Machinery Trailer is proving itself in full schedules. After more than a year of continuous operation, we can detect no signs of wear. And throughout this period, our Fruehauf has required routine maintenance only."

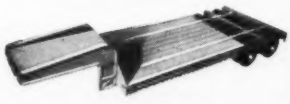
Fruehauf Machinery Trailers are precision-built to take heavy hauls right in stride. No matter what your hauling problem, you'll find Fruehaufs engineered with all the features needed to do *big jobs:* deep structural outside rails, rugged vertical supports, thick fir floors for easy load blocking, and unusually large level loading area, to name but a few.

Your nearest Fruehauf representative has complete information.

THERE'S A FRUEHAUF TRAILER FOR EVERY HAULING NEED


PLATFORMS


CHASSIS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TILT DECK TRAILERS

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"ENGINEERED TRANSPORTATION"

World's Largest Builders of Truck-Trailers
FRUEHAUF TRAILER COMPANY
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Sales and Service: Los Angeles • San Francisco • Oakland
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for handling Heavy Loads...

Buy the best—now built in the WEST!

Move your materials "thru-the-air" . . . *over* floor congestion — with the P&H Trav-Lift. It's the swift, safe one-man way to lift, transport and stack loads up to 15 tons *without* rehandling.

Only P&H builds the Trav-Lift . . . and it's now built in the West. It's custom made to your specific needs from standard cost-saving designs. You get the traditional P&H safety factors — all the P&H quality features that mean longer, finer performance. Capacities to 15 tons with various spans and lifting speeds, floor or cage control.

handle it "thru-the-air" at lower cost

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Branch Offices: Denver 2 — 1108 15th St.
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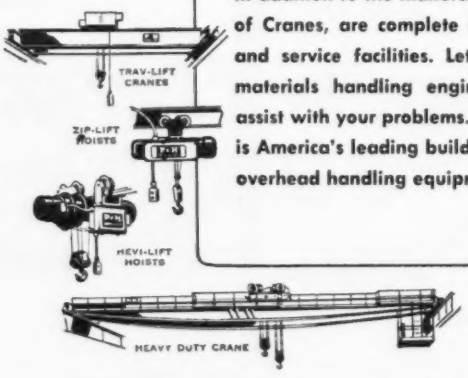
NEW P&H PACIFIC PLANT ANSWERS YOUR NEEDS

We invite you to visit P&H's new Pacific Division plant, now in full production. Here, in addition to the manufacture of Cranes, are complete sales and service facilities. Let our materials handling engineers assist with your problems. P&H is America's leading builder of overhead handling equipment.



POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES AND HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES

Pipelines, refineries, storage tanks–it takes plenty of steel to turn out petroleum products for your car and other needs. Last year, the West's oil refining industry used over 350,000 tons—enough to make a string of cars from Portland to San Francisco.

It takes lots of steel to fuel your car!

350,000 tons of steel went to West's oil refiners in '51

Every year, thousands of tons of steel are needed to refine the West's gasoline, motor oil, and other petroleum products. In 1951, over 350,000 tons of structural steel, steel sheets, plates, bars, and tubular goods went into moving crude oil from field to refinery . . . building and maintaining refining equipment . . . getting finished products to market. A big part of this steel came from Columbia-Geneva Steel Division, Western producing member of the industrial family that serves the nation—U.S. Steel.

West's largest source of steel

USS

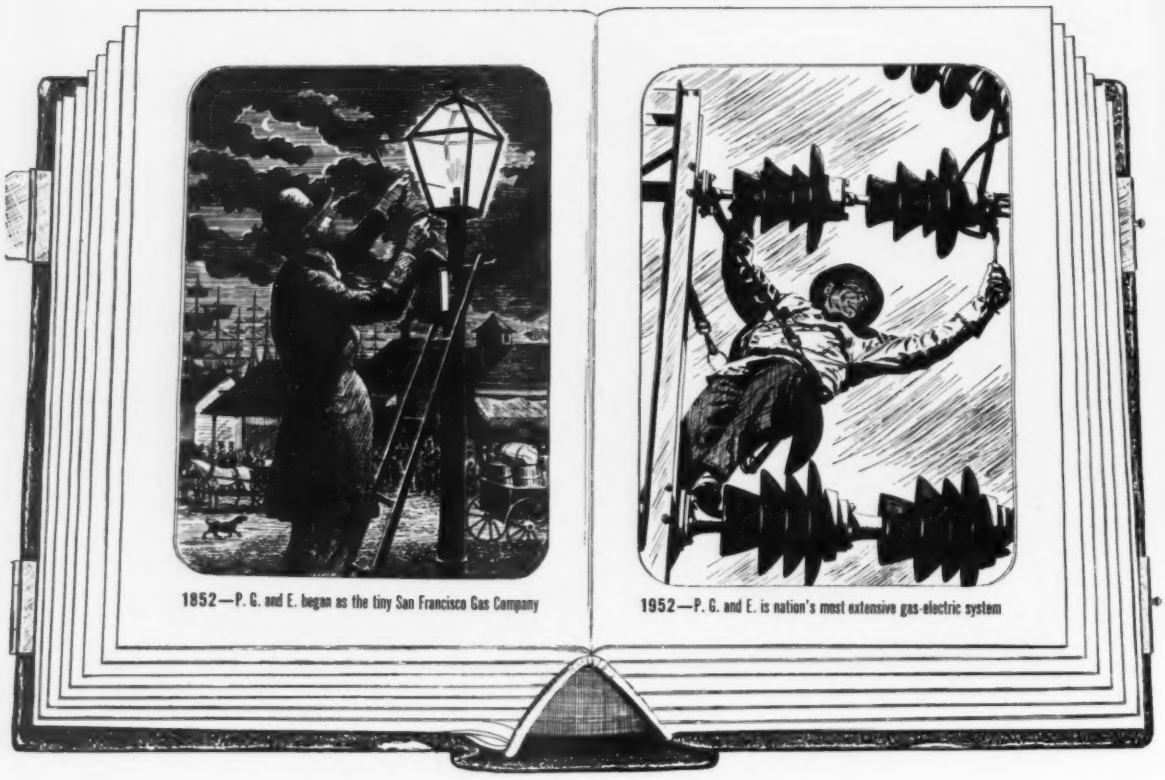
Columbia-Geneva Steel Division

United States Steel Company

UNITED STATES STEEL

100 YEARS EXPERIENCE

working for a better California



1852—P. G. and E. began as the tiny San Francisco Gas Company

1952—P. G. and E. is nation's most extensive gas-electric system

On August 31, 1852, P. G. and E. was born as the San Francisco Gas Company... and soon brought the first gas lights to the West.

The pleasantest memories of our first century are those of helping Californians live better year after year. In homes, in factories and on farms, new and increased uses for low-cost gas and electricity have helped people live more comfortably, produce more efficiently.

During the years to come, too, you can count on P. G. and E. services doing even more of your work ...and providing you with improved conveniences and extra leisure at bargain rates.

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

Our Centennial Year

9X-52

SLASH DOWN-TIME FOR HOT REPAIRS WITH PERMANENTE 84!

Don't let excessive down-time for hot repairs prevent you from getting maximum production from your open hearth or electric steel furnace.

Slash down-time to a minimum, increase your ingot production per year, with patented Permanente 84 *periclase* ramming and patching mix—by far the largest selling in the West.

Because Permanente 84 is dependable and easy to use, *faster hot repair* is possible. And because Permanente 84 gives superior bottom performance *fewer repairs* are required between heats. Here's why:

Permanente 84 is processed from high-purity sea water magnesia—gives an unbeatable combination of high refractoriness and chemical resistance. Its high density and chemical purity minimize penetration of slag and metals.

Permanente 84 is a western development—has set the standard for western industry for more than 10 years.

Get Permanente 84 *now* for open hearth and electric furnace rebuilds as well as for bottom, bank and tap hole maintenance.

Your western Kaiser refractory engineer will give prompt attention to your refractory problem. Western location insures prompt delivery to western users. Where desired, research, design and installation service is available to give you maximum production most economically. Write for descriptive literature on Permanente 84 and the companion ramming mix, Permanente 165. Sales office: *Chemical Division*, Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland, Calif.

Kaiser Chemicals

Pioneers in Modern Basic Refractories

Basic Refractory Brick and Ramming Materials • Dolomite • Magnesia • Magnesite • Alumina • Periclase

Special Fasteners .... Standard Nuts and Bolts

all from a Single Source

We are equipped to make practically any kind of steel fastener, bolt, nut, or headed-and-threaded item that you may need.

If your product calls for a special fastener, we can turn it out for you at our local plant, either to your own design or a design that we will prepare for you if you wish.

If you need standard bolts and nuts, we can furnish them promptly in any size. We manufacture these at all three of our bolt-and-nut plants, and carry large stocks for immediate shipment.

Call us on any bolt, nut, or fastener problem! And remember, no matter where you are located in the West, we have a manufacturing plant within convenient shipping distance.

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BETHLEHEM PACIFIC COAST STEEL CORPORATION

Los Angeles Sales Office: 3391 E. Randolph St., Vernon
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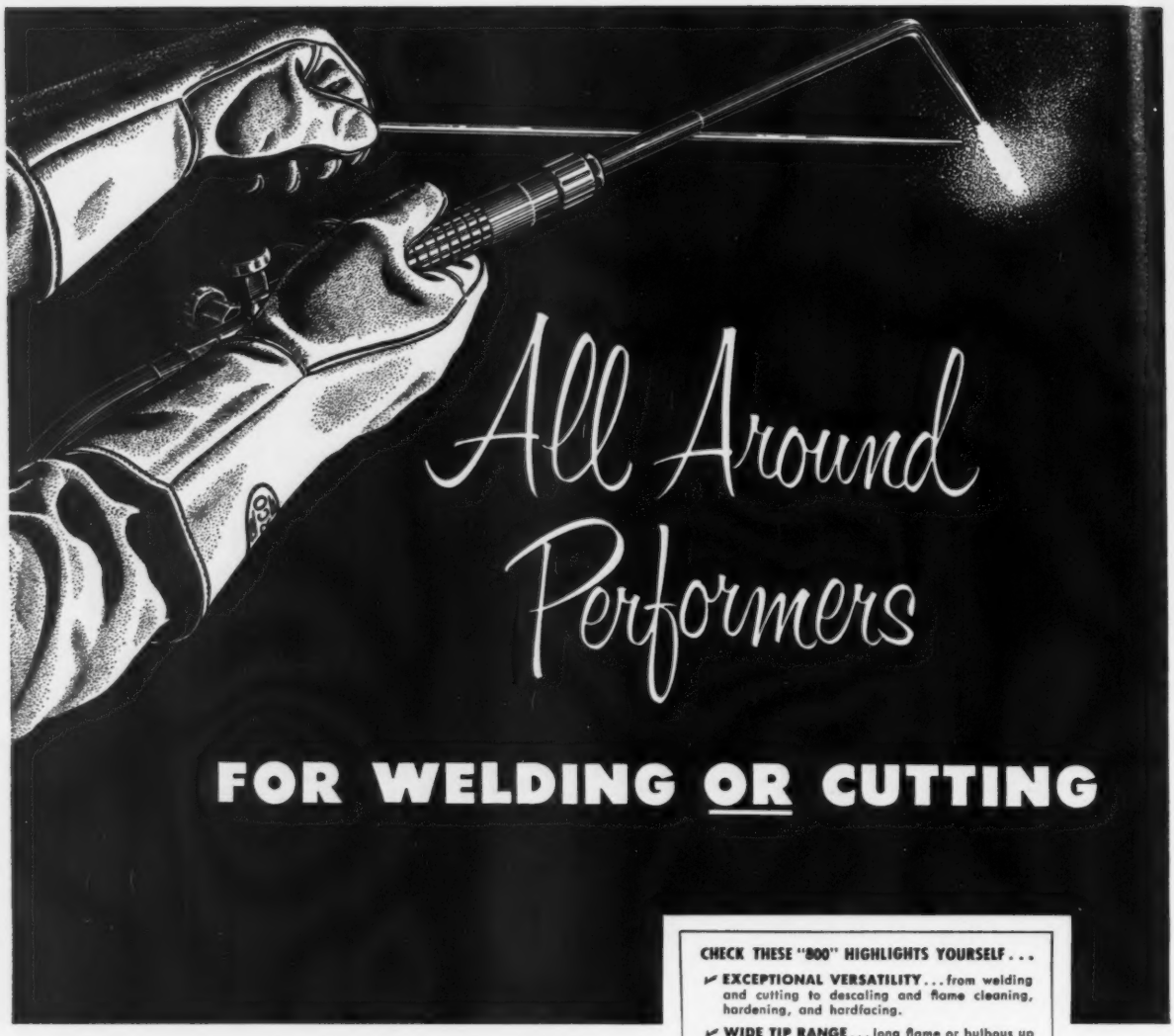
BETHLEHEM PACIFIC



FOR WELDING OR CUTTING

CHECK THESE "800" HIGHLIGHTS YOURSELF . . .

- **EXCEPTIONAL VERSATILITY** . . . from welding and cutting to descaling and flame cleaning, hardening, and hardfacing.
- **WIDE TIP RANGE** . . . long flame or bulbous up to size 10. In separable swaged tips—up to size 13.
- **LOWER OPERATOR FATIGUE** . . . 10 inches long; 21 ounce weight; planned balance minimizes operator fatigue.
- **FOR METAL CUTTING, TOO** . . . quickly converted for cutting either thin sheets or heavy plate up to 5-6" thick.

Ask for Catalog 2, Hand Torches for Welding and Cutting.

The Airco No. 800 Torch — with a wider welding range than any other torch on the market — is ready for any job from fine sheet work to heavy sections. A wide selection of tips permits unusual weld-and-cut versatility . . . while rugged construction makes it a natural for "rough and tumble" shop and field work.

AND . . . the Airco 8400 series two-stage regulator is your guarantee of constant gas pressure. One pressure setting needs no further attention. Saves time, gas, with trouble-free operation — gives better flame performance in welding and cutting. Ask for Catalog 5, Regulators.

SUPPLIES, TOO . . . Airco maintains a full line to complete the team for all around welding, cutting and hardfacing. Write for further information on welding rods (Catalog 12) . . . electrodes (Catalog 10) . . . as well as hardfacing alloys (Catalog 11) . . . and accessories, (Catalog 13).

AT THE FRONTIERS OF PROGRESS YOU'LL FIND AN AIR REDUCTION PRODUCT

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AIR REDUCTION PACIFIC COMPANY

A Division of Air Reduction Company, Incorporated

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Western Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

Townsend Builds New Cherry Rivet Plant for Better Service to You

Faster delivery on Cherry Blind Rivets and other Townsend products is now possible with the recent completion of a new half-million dollar plant at Santa Ana, California. The spacious, modern layout is designed to streamline production and provide for more efficient operation than was possible in the crowded Los Angeles location.

Increased demands by the U. S. Air Force and Navy for Cherry Blind Rivets to supply the aircraft expansion program made it necessary for Townsend to expand its facilities for this vital product which is virtually indispensable to aircraft construction. Their use makes possible refinements of design and assembly methods of control surfaces and other components that speed fabrication with big savings in unit costs. Cherry Rivets are installed by one man from one side of the work with a pulling action—without bucking, hammering or exploding.

The construction of this new Santa Ana plant is typical of Townsend's policy of constantly improving its manufacturing facilities—at Chicago, Illinois; Plymouth, Michigan and New Brighton, Pennsylvania. At these plants, new and faster equipment for manufacture of the 10,000 sizes and types of special and standard cold-headed fasteners produced by Townsend is being installed regularly as a part of its expansion and modernization plan.

This program makes it possible for Townsend to continue to supply all industry with high-quality products at reasonable cost—and helps speed production of defense and civilian items alike.

Townsend

COMPANY • ESTABLISHED 1816

NEW BRIGHTON, PENNSYLVANIA

Sales Offices in Principal Cities

Cherry Rivet Company Division, Los Angeles, Cal.

THE FASTENING AUTHORITY—Experience: *over 136 years*—**Capacity:** *sixty-million parts daily*—**Products:** *over ten-thousand types of solid rivets—cold-headed parts—Cherry Blind Rivets—Twinfast Screws—self-tapping screws—tubular rivets—locknuts—special nails—formed wire parts.* **Plants:** *New Brighton, Pennsylvania—Chicago, Illinois—Plymouth, Michigan—Santa Ana, California.*

KINGWELL

Gives Better Service on Bronze Bushings

Fast...
Dependable

FAST — because we ship immediately from big stocks right here on the Pacific Coast — or manufacture promptly in our California plant.

DEPENDABLE — because Kingwell not only operates its own foundry and machine shop but is also exclusive area representative for ASARCO CONTINUOUS CAST BRONZE BAR STOCK (A. S. & R. Co.) and OILITE SELF-LUBRICATING BEARINGS, A CHRYSLER PRODUCT.

TRY KINGWELL FOR BETTER SERVICE!

"LEADERS IN BRONZE" SINCE 1855

KINGWELL BROS., LTD.

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C. W. Marwedel
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Masterso Bearing Co.
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Towne Equipment Co.
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B. C. Bearing Engineers, Ltd.
1393 Granville Street

Yale & Towne Manufacturing Company, Philadelphia Division, Philadelphia, Pa. Architect: Ballinger Company. General Contractor: Turner Construction Company. Roofing Contractor: Warren Ehret Company. This Koppers Roof is bonded for 20 years.

FOR BUILDINGS LARGE . . . OR BUILDINGS SMALL . . .

Koppers Roofing Tops Them All!

Residence in Williamstown, Mass. Architects: E. H. & M. K. Hunter, Hanover, N. H. Roofer: S. Morin Roofing Company. This Koppers Roof is bonded for 20 years.

Roofing Materials now available from Koppers New Plant at Fontana, California

KOPPERS

Look at the huge roof that protects Yale & Towne's Philadelphia plant. It is 727,000 square feet in all, and dwarfs the roof on the modest dwelling. Yet *both* Koppers Roofs are built-up with the same high-quality roofing materials—Koppers Pitch and Felt.

Fact is, all Koppers Roofs, regardless of size, are basically the same. Koppers Built-Up Roofs consist of alternate plies of Koppers Approved Tarred Felt cemented with Koppers Coal Tar Pitch. The result is a roof that resists prolonged contact with water *without deteriorating*. A roof that is self-sealing if small breaks occur. A roof that is rugged and long-lasting.

But Koppers does more than *talk* about long-life roofing. Koppers will actually *guarantee* the performance of its roofing materials by offering to bond them for 10, 15 or 20 years in such sections of the United States as are covered by our inspection service.

Koppers Roofing Materials are available from coast to coast. Specify these materials, and your projects will have the best in built-up roofing. Inquiries are invited, and will receive prompt attention.

KOPPERS COMPANY, INC., Pittsburgh 19, Pa.

Western District Office: 727 East Gage Ave., Los Angeles 1, California

OTHER DISTRICT OFFICES: BOSTON, CHICAGO, NEW YORK, PITTSBURGH, AND WOODWARD, ALABAMA

• SPECIFY KOPPERS FOR LONG-LIFE ROOFING •

The sequence of operations from steel casting to finished pinion illustrates the extensive facilities of National Supply's Industrial Products Division. After casting from special analysis steel, and heat-treating to steel mill specifications, these pinions were turned, faced, milled, finish-turned, faced, bevelled, chamfered, grooved and balanced.

These manufacturing steps represent just a few of the capabilities of this conveniently-located western machinery building plant. And, the steel industry is just one of those served by the Industrial Products Division which lists among its customers such other industries as mining, aircraft, naval ordnance, transportation, cement.

This experience and these facilities are so readily accessible to all western industry that the Torrance plant of National Supply is the logical source for cast, forged, welded, and precision-machined parts and assemblies. Why not visit Torrance and determine for yourself how National Supply's Industrial Products Division can help you?

Rough turning steel pinion casting on heavy-duty lathe.

THE NATIONAL SUPPLY COMPANY NSCO

INDUSTRIAL PRODUCTS DIVISION

THE NATIONAL SUPPLY COMPANY

TORRANCE, CALIFORNIA · LOS ANGELES AREA

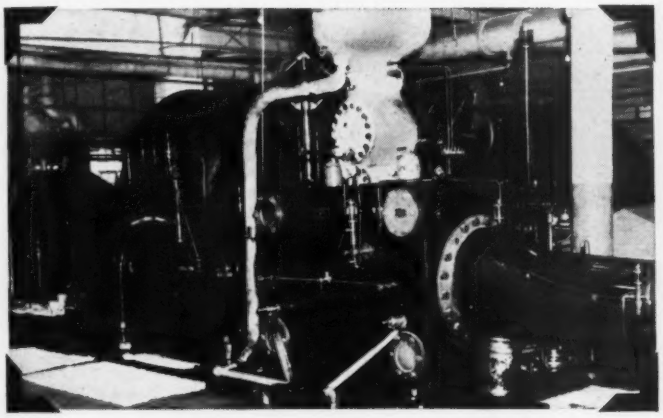
IDEAL PRESSED STEEL FORGINGS • BILLETS AND LARGE BARS
STEEL CASTINGS AND SPECIAL MACHINERY

MELTING • FORGING • CASTING • MACHINING • HEAT TREATING
ASSEMBLING • WELDING • TESTING

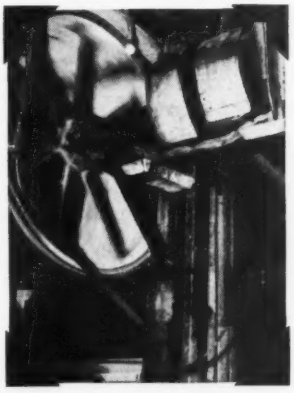
STANDARD ENGINEER'S REPORT

DATA	
LUBRICANT	Calol Red Engine Oil
UNITS	Steam-engine and line-shaft bearings
LUBRICATOR	Ring and drip-feed oilers
CONDITIONS	Constant load
PERIOD	20 years
FIRM	Spreckels Sugar Co., Manteca, Calif.

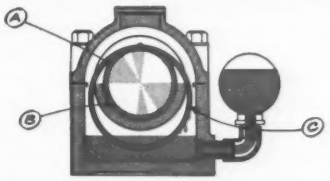
Bearings in service 20 years are still good!



LUBRICATED WITH CALOL RED ENGINE OIL since installation 20 years ago, the 800–900 H.P. steam engine (above) and 500–600 H.P. steam engine (right) still have their original main bearings. One operates a large generator, the other all the machinery in the Spreckels Sugar Company factory at Manteca, Calif. Ring-oiled line-shaft bearings throughout the factory also get Calol Red Engine Oil. "I've never found another oil that would do a better job of reducing wear and holding down maintenance costs. And I came here in 1936," says Mr. M. J. Schadeck, Master Mechanic. Calol Red Engine Oil will meet the toughest conditions in your plant. Comes in several grades.



How CALOL Red Engine Oils cut industrial lubrication costs



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STANDARD OIL COMPANY OF CALIFORNIA

EDITORIAL COMMENT

Touchdown and Home Run Combined

"TOO OFTEN executive, supervisory and staff assignments are overlapping or incomplete, with several people nominally responsible but no one really in a position to 'carry the ball'," said Lounsbury S. Fish, assistant manager, department on organization, Standard Oil Company of California, in a recent address before the California Personnel Management Association.

"Major responsibilities are apt to be dissipated and diffused among unnecessary management positions, levels, layers and linkage. Matters have to go from 'Tinker-to-Evers-to-Chance' for decision when Tinker could just as well be tooled up to handle them satisfactorily in the first place."

It also seems to be true that the right man can "tinker" with both football and baseball language in the same paragraph and not only get away with it but also score heavily in explaining that intelligently decentralized organizations, whether large or small, are the most effective.

Keep Troubles Localized

THE INDUSTRIAL Conference Board of Tacoma feels that Congressional attempts to diminish the chances of nationwide shutdowns of industries through strikes should not interfere with established bargaining methods of minor regional groups who have found stability in multiple employer and multiple union bargaining.

Writing to Representative Lucas regarding the pending Lucas Bill, Manager M. J. Muckey of the Industrial Conference Board says "This method of bargaining is particularly typical of the Pacific Coast, where unions are strong and employer units are small. Examples are the candy industry in the Seattle-Tacoma area, and the furniture industry in the Seattle-Tacoma-Portland area."

Exasperating as some of our regional difficulties may be, such as the maritime industrial situation in Pacific Coast ports, we are much better off to keep them localized as far as possible.

One Family

ONE OF THE HAPPIEST examples of good human relations we have encountered in a long while is the space in the last annual report of Solar Aircraft Company, San Diego, headed "Solar men and women who serve their company and community."

It lists the community activities of various members of the organization: scoutmasters, technical society committeemen, church positions, service clubs, trade association posts, school boards, PTA, flower and gardening clubs, and so on.

Just a thoughtful recognition by management that its employees are good citizens, and a gentle reminder to stockholders that in the larger sense all of us belong to the same family.

IN OUR MAILBOX

Laboratory Situation

Editor, *Western Industry:*

The article promoting the Washington State Institute of Technology in your June issue concludes that testing and other non-research requests are referred to commercial laboratories, and therefore commercial laboratories have found the Institute non-competitive. Most commercial laboratories *do* research work. Therefore, the Institute *is* competitive to us.

Commercial laboratories do not object to competition by other legitimate commercial laboratories. The term "commercial laboratories" means laboratories that work for hire. The Institute works for hire. Is not, then, the Institute also a "commercial laboratory"?

Then, why is the Institute sensitive about competing with commercial laboratories? It is because the Institute—like others in its class—self-called non-profit research institutes—was underwritten by and continues to be supported (at least in part) by taxpayers? Thus the taxpaying commercial laboratories become unwilling contributors to the support of this unusual competition offered by research institutes. This practice is just a small insult to add to injury, because the commercial laboratories' portion of total taxes is small. But the taxpayers at large—the American people—are paying for research, the results of which are withheld from the public. It is sensitivity about this point that makes the Institute cry "non-competitive."

The Institute is a device by means of which the state (universities and colleges) enters wide-open competition with free-enterprise business. The commercial laboratories feel justified in asking that tax-free institutes work completely for the public gain. Otherwise, we would be pleased to have the competition on a tax-paying basis.

DAVID E. CHARLTON
Member of Committee on Legislation
American Council of Commercial Laboratories
Charlton Laboratories
P. O. Box 1048, Portland 7, Oregon

(Western Industry's article was intended to set forth impartially the facts about the Washington State Institute of Technology, but its columns are always open to comment and criticism.)

* * *

A Steel Pipe Cinch

Editor, *Western Industry:*

In your publication of July 1952, on page 32, you show a toothless band saw made by Solar Aircraft Company, San Diego, California, from ordinary box strapping.

We are using a standard band saw on stainless pipe alloy steel and cold rolled, and having the usual amount of trouble.

We would like to get more information on this new type of saw.

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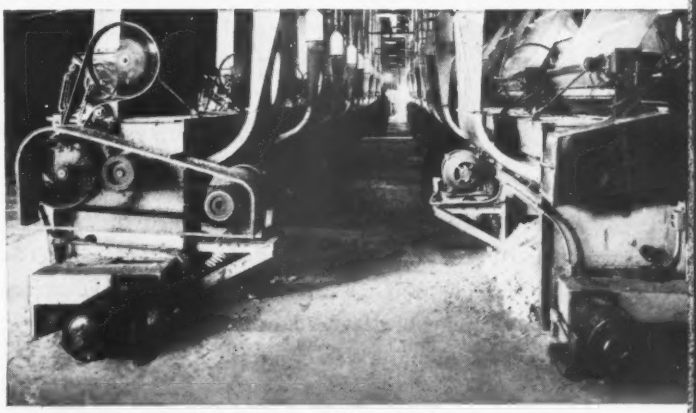

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GENERAL ELECTRIC

CALENDAR OF MEETINGS

Sept. 22-25—American Mining Congress, biennial metal and nonmetallic mineral mining convention and exposition, in Denver. Contact Society headquarters, 1200 18th St., Washington, D. C.

Sept. 26-27—Intermountain Purchasing Agents, Pacific District No. 1 regional meeting in San Francisco. Contact E. G. Chambers, executive secretary, 461 Market St., San Francisco.

Sept. 28-30—Pacific Northwest Trade Association, fall conference, Yakima. Contact D. C. Knapp, executive secretary, 219 Olympic Hotel, Seattle.

October—Manufacturers Association of Colorado, state banquet in Denver. Contact L. H. Kittell, 205 Colorado National Bank Bldg., Denver 2, Colo.

Oct. 1-2—California Manufacturers Association annual meeting, Los Angeles. Contact Mr. John Knauft, 315 W. 9th St., Los Angeles 15.

Oct. 11-14—National Association of Waste Material Dealers, fall meeting at Hotel Ambassador, Los Angeles. Contact association headquarters, 271 Madison Ave., New York.

Oct. 12-16—National Canvas Goods Manufacturers Association, San Francisco. Contact Fred W. Behnke, 1132 Mission St., San Francisco.

Oct. 17-18—Northwest Personnel Association regional conference at Davenport Hotel, Spokane, Wash. Contact Marion R. Jenkins, Whitworth College.

Oct. 21-23—28th Pacific Coast Management Conference, at Claremont Hotel, Berkeley. Contact Everett Van Every, Secty.-Mgr., California Personnel Management Association, Farm Credit Bldg., Berkeley 4, Calif.

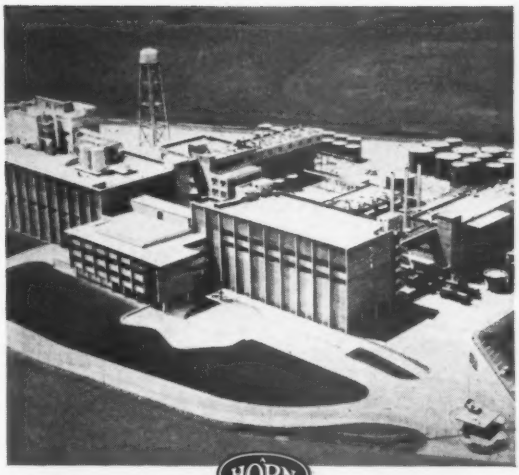
Oct. 24-25—Second Western Regional Training Conference, sponsored by Training Association of Southern California, will be held at the Ambassador Hotel, Los Angeles. Ralph Boynton, Bank of America, Los Angeles, is in charge of registrations and advance reservations.

Oct. 28-31 — American Waterworks Assn., California Section, in Pasadena, Calif. Contact A. R. Houseman, 907 Monadnock Bldg., San Francisco, Calif.

November—Northwest Assn. of Ice Industries, regional meeting in Everett, Wash. Contact L. F. Marsh, 1539 N.E. 37th St., Portland 13, Oregon.

Nov. 4-8—National Wheel and Rim Association convention in San Francisco. Contact W. J. Renehan, con-

continued on page 28



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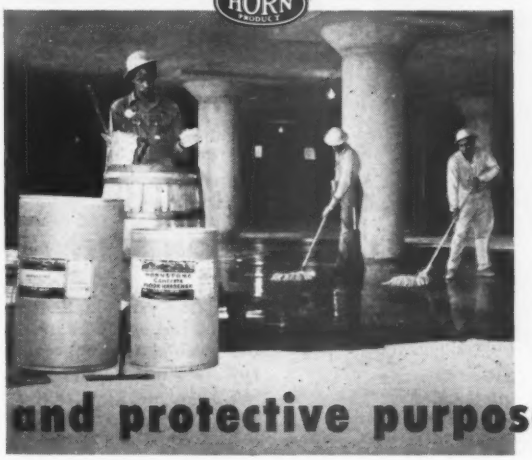

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CALENDAR OF MEETINGS

Begins on page 26

vention chairman, c/o Stonewheel, Inc., 2540 S. Wabash Ave., Chicago, Ill.

Nov. 9-10 — California Refrigerated Locker Association state convention. Contact Morris W. Walker, convention chairman, 372 Castro St., Hayward, Calif.

Nov. 10-12—California Fertilizer Association Convention, at Desert Inn, Palm Springs, Calif. Contact Sidney H. Bierly, Exec. Sec. and Mgr., 4700 District Blvd., Los Angeles 58, Calif.

Nov. 10-12—Pacific Logging Congress regional meeting. Contact Carwin A. Woolley, secretary, 1222 American Bank Bldg., Portland, Ore.

Nov. 12-14—Annual meeting of National Reclamation Association in Long Beach, Calif. Contact William E. Welsh, secretary-manager, at National Press Bldg., Washington 4, D. C.

Nov. 13-14—Association of Food Industry Sanitarians, 1952 national convention in San Jose, Calif. Contact E. S. Doyle, 1950 Sixth St., Berkeley 2, Calif.

Nov. 15—National Society of Professional Engineers of Arizona, state banquet in Phoenix. Contact Americo Lazzari, 4324 N. 14th Ave., Phoenix, Ariz.

Nov. 20 — Purchasing Agents and Manufacturers, district conference in Oakland. Contact Ken Moeller, Oakland Chamber of Commerce, 427 Thirteenth St., Oakland 12, Calif. GLencourt 1-7800.

December—Northwest Scientific Assn. regional meeting in Eugene, Ore. Contact L. C. Cody, University of Idaho, Moscow, Idaho.

Dec. 1-2—Northwest Mining Assn., regional meeting in Spokane, Wash. Contact E. C. Stephens, Peyton Bldg., Spokane 4.

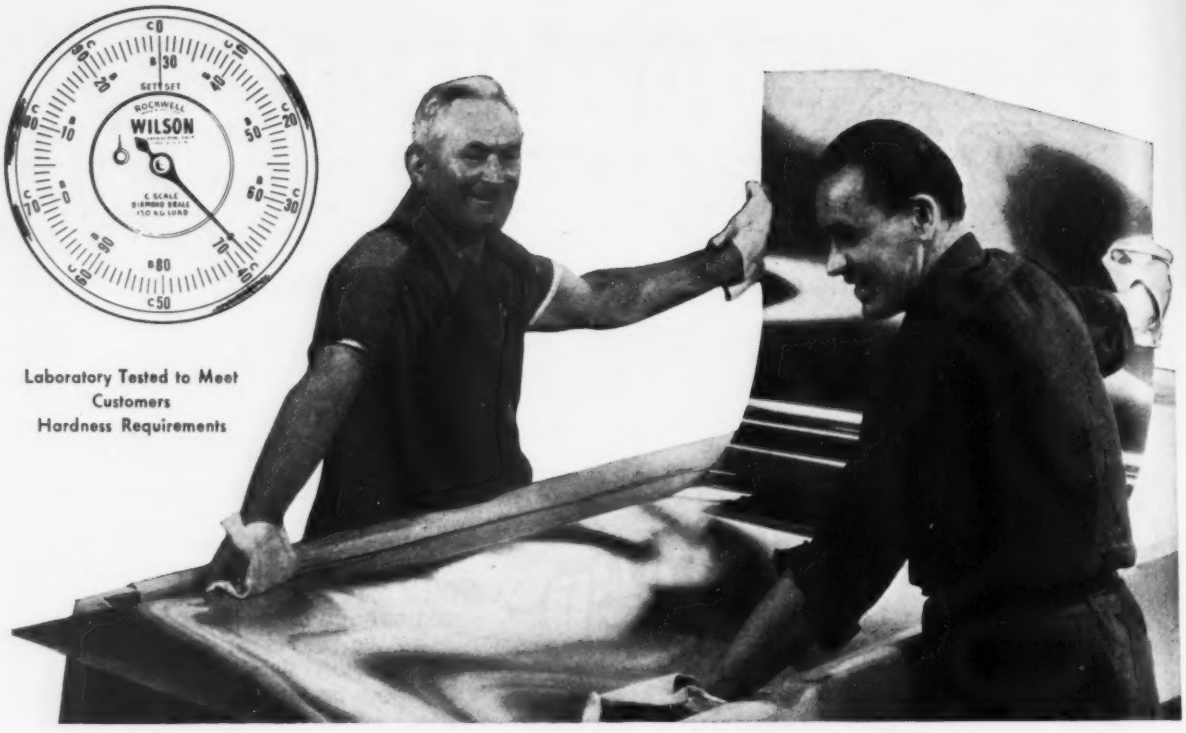
Dec. 4-5—California State Chamber of Commerce state meeting in San Francisco. Contact James Mussatti, general manager, California State Chamber of Commerce, 350 Bush St., San Francisco.

1953

Jan. 12-14—The American Dehydrators Association convention in Phoenix, Ariz. Convention headquarters will be at Jokake Inn and Paradise Inn, Phoenix.

Jan. 19-20—Northwest Canners Assn. regional meeting in Seattle. Contact C. R. Tulley, 514 Board of Trade Bldg., Portland, Ore.

Feb. 4-6—Transportation and Traffic Engineering Institute's 1953 California state banquet at Berkeley, Calif. Contact Bob Glenn, Bldg. T-7 University of California, Berkeley 4.



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The steel was then trucked to the airport, flown to Seattle and delivered on schedule.

This is a typical example of how Ryerson often can help you meet unusual specifications. It's an example of how large, diversified stocks, unequalled facilities and the practical cooperation of steel specialists are combined at Ryerson to save you time and trouble. And it's a good reason for you to call Ryerson whenever you need steel.

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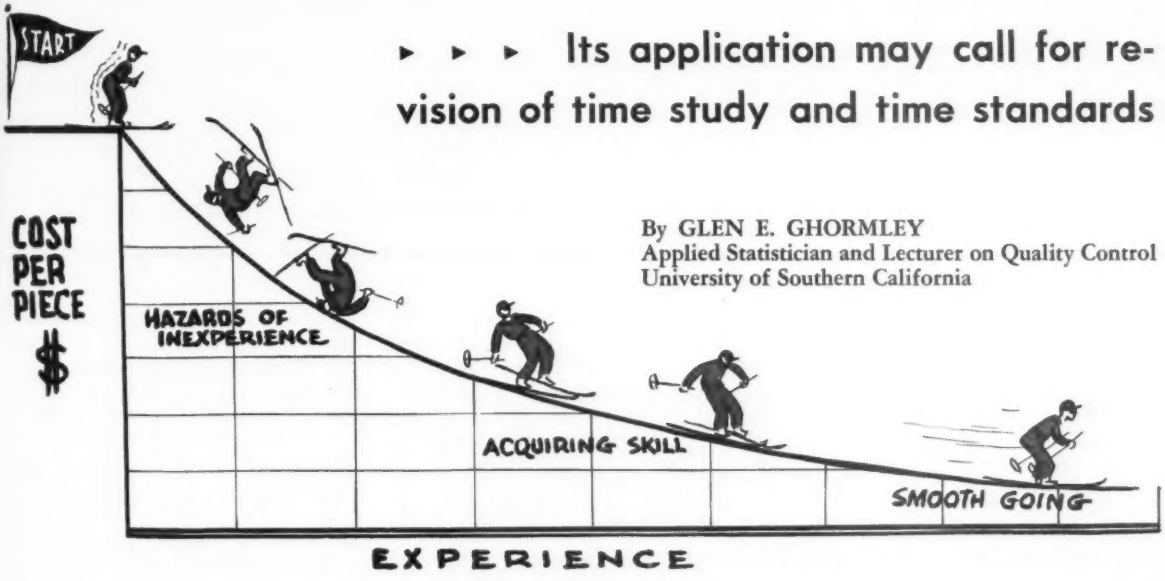
WESTERN INDUSTRY
SEPTEMBER 1952

THE LEARNING CURVE

▸ ▸ ▸ Its application may call for revision of time study and time standards



By GLEN E. GHORMLEY
Applied Statistician and Lecturer on Quality Control
University of Southern California

Here graphically is why any task is easier, and costs less . . . when you know how.

THE LEARNING CURVE is a relatively new and little understood tool for the engineer and business manager, but one that appears to have many practical uses. The good results obtained in some applications seem to argue that we extend the use of the curve even while we continue to study its characteristics.

For our consideration, it would seem appropriate to restrict the interest of the practicing engineer to learning and those of its aspects that fill the two following conditions:

1. The results must be reflected in added profit to the company;
2. The results must be measurable and predictable.

The engineer must have formulas or tables with which to work. Random or unpredictable effects can hardly be applied to the solution of our problems.

The phenomena considered in this article will be restricted to those that involve production problems in which the time per unit produced is lowered in predictable ways with practice or habituation.

Typical Set of Data

To make clear the type of phenomenon encountered, we will offer two sets of data. Chart 1 shows the first 8-months production by a "green" operator. Chart 2 shows data selected from the production record of an operator in her sixteenth year of experience.

Both are "stayer operators" in the set-up paper box factory of the Los Angeles Paper Box and Board Mills. The data were kindly made available by Will Kewell, president of the company.

"Staying" is the process of running a glued strip down the corner of the "set-up" or non-folding paper box. The operation first gives the box its basic shape. The equipment is simple,

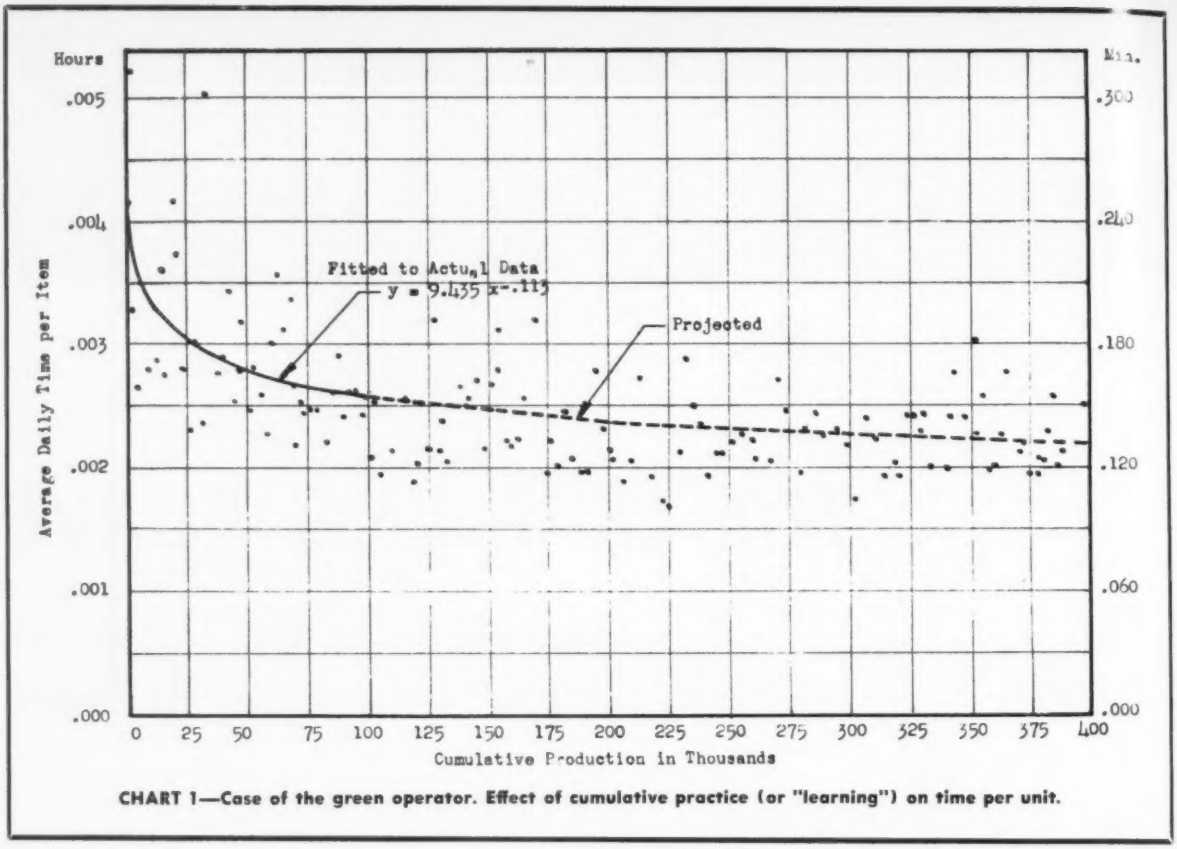


CHART 1—Case of the green operator. Effect of cumulative practice (or "learning") on time per unit.

consisting of an anvil-type arm which reaches out toward the operator seated at the machine.

The cardboard stock, with the corner cut out, is bent downward by the operator along two edges so that the corners are brought together. The corner is held in position over the arm while the operator trips a foot lever, causing a glued strip to be cut off to an appropriate length and attached to the corner of the box.

One corner being glued or "stayed," the operator turns the box through 90 degrees and stays the next corner. Thus each box and its cover are stayed at each of its four corners. A good operator will stay about 8,000 boxes in an 8-hour day.

The machine cycle is fast enough not to bring about any waiting time. The rate of production is under the control of and dependent upon the operator, but it varies widely both between operators (depending on skill and motivation) and for the same operator, varying with the size and shape of the box.

Chart No. 1 shows the daily production record of employee No. 83 by days from the date of her entry on the job, April 30, 1951, through December 31. No effort has been made here to classify jobs either as to difficulty, number of similar jobs previously handled nor any other factor that might affect the rate. The only independent variable considered is the number of boxes previously made, or cumulative production. The dependent variable is the daily ratio:

$$\frac{1{,}000 \times \text{time in hours}}{\text{Production}}$$

The solid line of best fit was calculated from data over the actual production for the first 100,000 boxes only. It is extended in order to extrapolate over the remainder of the year, "predicting" along the dotted line. The method of fitting the data was by minimizing the squares of the logarithms of the vertical or y-deviations. The curve employed is the exponential,

$$y = ax^b,$$

Where y is the time per cycle in .001 hours and x is the cumulative experience in terms of boxes produced. In logarithmic form,

$$\log y = \log a + b \log x.$$

The fitted equations for this set of data are, respectively,

$$y = 9.435\, x - .113$$

and

$$\log y = .975 - .113 \log x$$

There are available 144 data, representing a total production of 400,092 for the eight months. The slowest rate recorded was on the first day, 5.22×10^{-3} hours or .313 minutes per box.

WHAT IS THE "LEARNING CURVE"?

It is the principle that experience gets work done faster, that the tenth piece should not cost as much as the first piece.

Or, put another way, if the first time you make an item it requires 10 manhours, the second time it should take eight hours, the hundredth time a good deal less, say 6¾ hours, and the thousandth time it should be made in substantially less, for example, two hours.

The slope of the curve depends, of course, upon various factors, such as how many operations can be mechanized or done in multiple, how much the layout of material and the arrangement of processes can cut lost time in handling, and the other things that bring about the economies of mass production.

The best was on September 19, 1.66 $\times$ 10^{-3} hours or .0996 minutes. The average over the eight months was 2.24 $\times$ 10^{-3} hours or .134 minutes.

For comparison, operator No. 37 with 16 years' experience produced 1,273,371 boxes in twelve months at an average time per box of 1.027 $\times$ 10^{-3} hours or .062 minutes each, about half the time of the green operator. Variance analysis shows that the effect of learning is significant at the 0.1% level, that the curvilinearity is also highly significant at the same level.

We may conclude, therefore, that the effect of taking into account the amount of previous experience is to make it possible to estimate or predict with materially greater accuracy as compared with basing an estimate on average of prior performance, as is usually done in estimating.

The second set of data show two long runs on the same box by operator No. 37 in her sixteenth year of experience. The box is the familiar See's ½-lb. mint box whose dimensions are 6¾″ × 1¾″ × 2″. The first run was a total of 50,300 begun on January 9 and finished January 17. The second was for a total of 99,400 beginning March 6 and finished on March 22.

We presume, although we do not know, that this constituted the entire order. Separate curves were fitted to the two sets of data by the method of minimizing the sums of squares of logarithms of daily production rates.

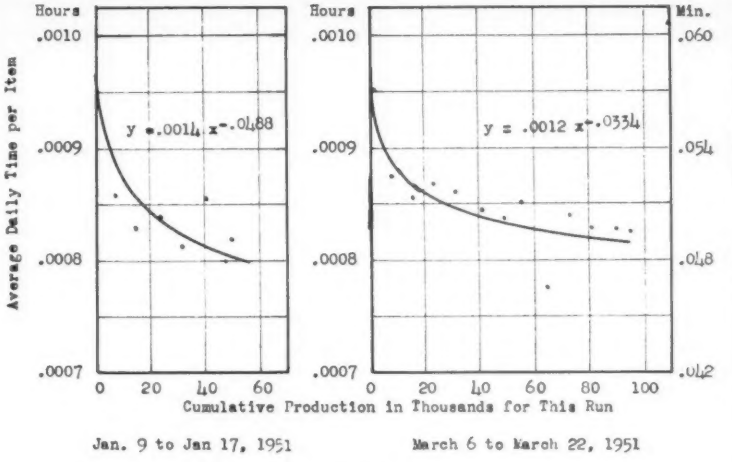


CHART 2—How 16 years' experience, plus ability, shows up on the learning curve. See text for analysis and discussion.

Hypotheses

Several points stand out from an examination of these and other sets of data. It is our purpose to make some generalizations, first considering the nature of the learning process itself and then centering on possible applications to some of our own special problems:

1. Depending on the Intrinsic Nature of the Curves

a. The learning effect is a highly significant factor in estimating the time of an individual worker for performing a given repetitive task. (Significance is here used in the stochastic or probability sense.)

b. The learning effect is a highly significant factor in estimating the time of an organized group such as a company or department for performing a repetitive task.

c. The group learning effect is not the sum of the learning curves of the individuals making up that group. The difference between the group learning effect and the sum of the learning curves making up the group is probably due to more or less improvement in management.

d. With a lapse of time between runs of the same task, the individual or group suffers some forgetting and must relearn the process before it regains its former efficiency.

e. There is some carry-over of learning from one task to another—probably due to and probably proportional to the number and kind of common elements.

f. The slope of the learning curve is characteristic of the operator or the group. It is presumed that the intercepts are general, but the extent of generality is not understood.

2. Depending on Industrial Applications of the Learning Process Function

a. *For estimating,* the learning curve, integrated between the desired

HERE'S THE OPERATION analyzed by the learning curve method in this article.

limits, provides a significantly more accurate forecast than any other methods of the manhours that will be required. The type curve used for illustration herein requires that we know the slope characteristic of the company or employee who will do the job and one point somewhere on the line.

b. *For scheduling* work through the various departments of a company, the learning curves for the respective departments provide a significantly more accurate forecast of the manhours likely to be required in each. Again, we need to know the slope characteristic of the respective departments and one point through which we may pass the curve. Integration between the desired limits completes the estimate for that department.

c. *For budgeting,* the problem seems somewhat more complicated. In the degree that budgeting the various departments of a company depends on the number of man-hours likely to be required for anticipated specific tasks, the amount to be budgeted will depend significantly on the anticipated parameters of the learning curve, and hence on the number of items to be produced, the degree of newness of the tasks and the lapse of time between runs.

d. *For estimating future personnel requirements,* we have a problem corollary to ability to estimate and budget more accurately.

e. *For personnel placement and vocational guidance,* we would calculate the parameters characteristic of that operator and predict if he will be successful in a reasonable length of time by comparison with the parameters of the curve for successful operators.

For example, in the cases cited above, beginning operator No. 83 would take about 60 years to achieve the production rate of operator 37 achieved by her in 16 years! It hardly seems likely that the new operator will ever attain the same proficiency. It seems unlikely that it would be to the company's or the employee's advantage for her to continue on this job unless training or incentive can increase her rate of learning.

f. *Motivation.* We might try to save this operator if circumstances make it worth while to try by giving her the incentive of piece-work for stimulating the rate of learning. This is a knotty problem, because a standard suitable for an experienced operator would be out of reach of the beginner and discourage, rather than stimulate him. Perhaps the problem is not insoluble, provided we can gain acceptance of the idea of easier standards for the learner.

Another aspect of the incentive problem that is more generally acceptable, is that standards should be lower for short runs and for tasks having a large percentage of new, unlearned elements.

g. *Time study and time standards* methods would seem to need revision, going all the way back to some basic concepts:

1. There seems to be no point at which "the operators have thoroughly learned the job and hence may be time studied," as we now pretend. In the concept of the learning curve, the degree of learning is not absolute, but related to the amount of previous habituation—this functional relationship extending at least to 16 years and over 16,000,000 items in the case cited above.

GLEN E. GHORMLEY, author of "Learning Curves", is Applied Statistician and Lecturer on Quality Control at the University of Southern California.

The degree of learning attained by the operator at any point is not constant, but a joint function of the number of previous repetitions and other factors of motivation, amount of carry-over from previous similar but not identical experience, recency of similar tasks and other factors.

2. Time standards should take into account the length of the "run," for the standard that is comparatively easy to achieve for a long run would be difficult or impossible for a short run on the same production operation.

3. Time standards should take into account the forgetting curve. The effect of lapse of time since previous performance of tasks having common elements with the one on which standards are being set, as well as the nature of the intervening interruption effect the definition of a fair day's work.

h. *Application to research and investigation.* The learning curve will provide a tool greatly needed by research people and investigation-minded engineers and management men.

For example, suppose a new manual has been prepared or a program of employee-counselling or a training program has been instituted. The resulting effect on production can be demonstrated by tracing the break in the learning curve, if any. Furthermore, it provides a tool for measurement of the dollar benefits.

Referring to Chart 2 again, we wonder how much it would be worth to know why employee No. 83 got the very low point in the first series. Was it an accident—perhaps a clerical mistake purposely or accidently made in recording the time or the production for that day? Or was there another assignable cause? Was this cause an added psychological block?

Without testing, it would appear that the difference would almost certainly prove significant in the stochastic or probability sense. We might surmise trouble at home or a quarrel with fellow workers, resentment against some action of the supervisor, bad cardboard from a new vendor, poor corner-cutting by a careless employee, poor glue, a machine slightly out of adjustment. These questions are not trivial to an alert management.

It would not seem too much to hope that we have here a powerful new tool for investigation. It would seem feasible to borrow the device of the Quality Control people to get immediate analysis and action. Points falling outside predetermined control limits would need to be accounted for, while those inside those limits would be ignored on the assumption that they constitute random variation characteristic of human effort.

Summary

By way of conclusion, it would appear that the learning curve is an extremely versatile tool for use in management fields. It invites us to do a great deal of study upon it before we understand it completely. But even in its present crude form, it already is being put to extensive and profitable use. It would appear, further, that it implies a need for extensive revision of our text books.

Article adapted from a lecture delivered before the American Society of Mechanical Engineers at the University of California at Los Angeles.

SUBSEQUENT ARTICLES

THIS ARTICLE will be followed by several others on the learning curve by Mr. Ghormley, as follows:

1. **Evaluating Supervision by the Learning Curve.**
2. **Avoiding Costly Job Misfits with the Learning Curve.**
3. **Evaluating an Organization Change by Means of the Learning Curve.**

WESTERN PROCESSES AND PRODUCTS in Today's View

ALL IT NEEDS IS TEETH, and this 72 in. diameter, 1500 lb. steel ring will be a gear. The ring was roll forged from 22 in. dia. round billet stock, on a 76 in. rolling mill, and rough-machined on the 86 in. boring mill at C.B.S. Steel and Forge, Los Angeles.

LESS WORK—MORE LETTUCE is the result of this new packaging method in use by Bud, Inc., large Calif. lettuce growing firm. Two carton stitching machines mounted on the back platform of a truck, move packaging line right into the field.

LOADED YET? This device, devised by Lt. Col. Charles E. Kelley, Port Ordnance Officer at Oakland Army Base, tells the crane operator on-the-spot. It is a pendulum that swings over a quadrant on which is etched the load limit. Improves safety in handling, saves time and money.

CANS FOR THE FOOD OF CALIFORNIA will be made from this emergency shipment of tin plate rushed by American Can Co. from its Hawaiian plants to West Coast, to help dispel possible can shortage caused by 53-day steel strike. Shown unloading in San Francisco.

Highlights of progress in

MILITARY HANDLING

and

MILITARY PACKAGING

Tomorrow's answers to today's problems in practical discussions at Los Angeles meeting

AS THE PACKAGING and Materials Handling Institute held in Los Angeles Sept. 13-14 presented so much practical information of value to every reader of *Western Industry*, a resumé of most of the papers is given herewith.

The Institute was held under the auspices of the Extension Division, University of Southern California, and John R. Huffman, Associate Professor of Industrial Engineering, was general director of the Institute.

Cooperating were the industrial engineering and materials handling divisions of the Los Angeles section of ASME, the Los Angeles Chamber of Commerce, Materials Handling Association of Southern California, Society for the Advancement of Management, Society of Industrial Packaging and Materials Handling Engineers, and *Western Industry*.

Simultaneously the Packaging and Materials Handling Exposition was held in Shrine Auditorium, a highly successful event. It had been held in San Francisco in previous years, but this was the first occasion for Los Angeles, and the number of exhibits, attendance and general interest were noteworthy.

Fork trucks for packaged goods

By
ROBERT H. BRAUN
President
Robert H. Braun Corporation

APPLYING a fork truck properly to a handling problem begins with obtaining answers to the following four questions: (1) size, weights and types of packages; (2) weight or tonnage handled for period of time; (3) number of items; (4) number of stock turnovers.

Manufacturers for fork trucks have a "rule of thumb" for minimum floor load rating for each truck capacity, as follows:

Truck Capacity	*Truck Weights*	*Floor Load Capacity Required*
1,000 lbs.	2,200 to 2,500	150 to 175 lbs.
2,000 lbs.	3,700 to 4,300	175 to 225 lbs.
3,000 lbs.	5,700 to 6,200	200 to 225 lbs.
4,000 lbs.	6,400 to 7,200	225 to 275 lbs.
6,000 lbs.	10,100 to 10,500	300-up lbs.

A simple but accurate equation which determines the aisle width necessary for right angle stacking by a fork truck is as follows:

Aisle width = Outside turning radius + length of load + 6" clearance.

Example: a 4,000-lb. truck with an outside turning radius of 75" and handling a 40" long load would require an aisle width of 121", or 10' 1".

Placing the Load

The industry has more or less standardized maximum truck heights at 83"; this 83" limitation and a 2-to-1 lifting ratio upright permits lifts to vary from 112" to 124". To determine the necessary tiering elevation, total the heights of the bottom loads, then add the underhang of the pallet or container below the top edge of the forks and a minimum clearance factor of 2" for placing the load.

A 300-ft. limitation on the radius of operation is the "rule of thumb" followed if the operation is continuous. There are efficient, though intermittent, fork truck operations over a 1,000-ft. radius and a few trucks traveling a one-way distance of 1,400 to 1,500 ft. The 300 ft. is more or less a "danger signal." If the radius of operation is equal to, or more than that, then the possibility of supplementing the fork-truck operation with a trailer-train should be considered.

Operating Costs

Assuming fork truck operations for 8 hrs. per day or 2,000 hrs. per year under good conditions, the average hourly costs including all fixed and variable expenses are as follows:

2,000 lb. capacity truck.....35¢ hr.
4,000 lb. " " .....44¢ hr.
6,000 lb. " " .....57¢ hr.

These cost figures may be used for either gasoline or electric trucks, since by actual performance figures costs are about the same. Maintenance costs and down time are less for the battery-driven unit, but are offset by battery depreciation and the additional investment in charging equipment.

Truck Performance

Fork trucks operating indoors have a design top speed varying from five miles per hr. for battery-powered units to as high as seven miles for the gas-driven. However, load stability, floor conditions, aisle intersections, directional turns, etc., reduce the average speed to about 2½ to 3½ miles per hour of 250 to 308 ft. per minute.

Assuming (1) 60 seconds at terminals of travel for lifting, tiering, deceleration, acceleration and turning and (2) an average travel speed of 250 ft. per minute for carrying a load one way and returning empty, the following figures apply:

Distance between Terminals	*Trips per hour*
100 ft.	33
200 ft.	23
300 ft.	18
400 ft.	14
500 ft.	11
1,000 ft.	8½

The tonnage handled per hour is the product of trips per hour and the unit load weight expressed in tons. Thus 4,000-lb. loads can be moved an average distance of 200 ft. between terminal points at the rate of 46 tons per hour.

Cost Per Ton

Cost per ton of goods handled is computed as follows:

Handling cost per ton = Operator's pay

rate per hour + average operating cost per hour (i.e., divided by) trips per hour × tons per trip.

EXAMPLE: A 4,000-lb. capacity truck with a 44¢ per hour cost of operation plus operator's hourly rate of $1.50 results in $1.94 per hour total cost. Operating with terminals 200 ft. apart handling 46 tons per hr. resolves the cost to $1.94 divided by 46 or 4.22¢ per ton.

Trends in military packaging

By

Lt. Col. ROBERT W. JOHNSON
Chief, Packaging Section
Air Materiel Command
U. S. A. F.

IN THE LIGHT of development of national and worldwide economic conditions, I think we will never again be able to create and maintain huge outdoor stock piles of war material for combat activity. If we are to maintain a position of constant combat readiness we will have to work on a hand-to-mouth basis as far as pipeline length is considered, and this means we must devise the lightest and most inexpensive types of packaging for aerial delivery of war material. We can foresee that a larger portion of our supplies will move by air.

Items used in great abundance, such as petroleum, clothing, subsistence and ammunition comprise roughly 80% of our tonnage but represent only 20% of our dollar expenditures. This leads to the conclusion that we can very well afford to consider aerial delivery for that remaining 20% of our tonnage which represents an investment of 80% of our dollars, and I think it will give us a far less complicated solution to the problem of determining what and when we should package to the minimum standards.

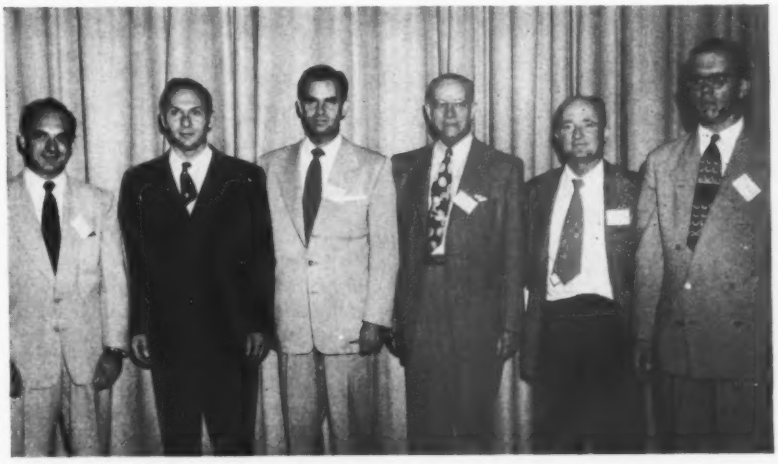
We can safely use the lightest box and most inexpensive type of preparation for shipment, because we will not make aerial delivery until those supplies are needed, and should therefore anticipate no long overseas storage and none of the hazards of rail and ship loading conditions.

Roughly 75% of our items are fairly regular in shape, reasonably small in size, simple in design and present no particular packaging problem. These can be so segregated and catalogued that the packaging will fall into determinable groups, leaving only 25% that require special packaging engineering talent and techniques.

The Air Force Packaging Board has been reconstituted as the Air Force Packaging and Materials Handling Board. A revision of the present Air Force Career Program is being de-

Continued on page 62

FROM LEFT—*Leslie C. Heller,* Vice-Chief, Packaging Section, Office of Naval Material; *J. D. Nunn,* Manager, Shipping Department, Lockheed Aircraft; *E. P. Troeger,* Supervisor of Process Engineering, Douglas Aircraft, Santa Monica; *Ray Pass,* Chief, Packaging Section, Quality Control Directorate, Western Air Procurement District; *Ralph C. Butler,* General Manager, Aircraft and Export Packaging Division, Lyon Van and Storage Co., Burbank; *Lt. Col. Robert W. Johnson,* Chief, Packaging Section, Air Materiel Command.



A. Mazzola, (Angelus Engineering) Chairman Materials Handling Division, Los Angeles Section, ASME; *A. J.* Rowe, Assistant Professor of Industrial Engineering, USC; *C. A. Bogenrief,* Chief Industrial Engineer, Grayson Controls Div., Robertshaw-Fulton Controls Company; *C. O. Burgin,* Burgin Associates; *Louis de Villeneuve,* Manufacturing Engineer, Lockheed Aircraft Corporation; *John R. Huffman,* Associate Professor of Industrial Engineering, USC, general chairman, program committee.

J. E. Owens, Supervisor of Plant Engineering, Douglas Aircraft, El Segundo; *Robert H. Braun,* Robert H. Braun Corporation; *Robert H. Edgecumbe,* Chief Industrial Engineer, Virtue Bros. Manufacturing Co.

1—First we make a plaster cast of the part for which we need a jig. Then we spray three coats of lacquer and one of separating wax on it to prevent sticking.

2—Meanwhile, another department is busy cutting out fiber glass sheets to outside shape, which has been traced from a pattern. "Sandwich" sheets come in a roll.

PRODUCTION TOOLING IS FAST

with fiber glass laminated jigs

ADEQUATE TOOLING for the drilling, trimming, routing and sawing of contoured and compound-contoured details, parts and assemblies has always presented a knotty problem in aircraft manufacturing.

One solution which Convair's San Diego division has investigated with significant success is the use of fiber glass laminated jigs. These have the advantage of being light, durable, easily reworkable to accommodate minor engineering changes, and relatively inexpensive.

Further, their fabrication is simple enough to be accomplished by the average shop worker rather than requiring the skill of a highly trained and scare mechanic or tool maker.

Fiber glass laminate can be laid directly on the production part itself or on a plaster splash, thus permitting the run-up of compound-contoured trim, drill and saw jigs in advance of the first run of production parts.

Finally, the ability to cure fiber glass laminates at room temperature when using polyesters eliminates the need for complicated and costly ovens and other heating equipment. Curing times vary from one to four hours.

Fiber glass laminated jigs are built up by the use of fiber glass cloth sheets with fiber glass matt as a sandwich material. Fiber glass mill ends are also used in building up vertical walls to avoid the draining off of the polyesters.

Although specifics will vary with the use of materials supplied by different manufacturers, the basic process of building up laminated fiber glass tooling will follow the steps illustrated by these shop pictures taken in the San Diego division of Consolidated Vultee Aircraft Corporation.

3—After tacking a wax edge strip to the plaster splash, fiber glass sheet is then laid over the splash and brushed with polyester mix.

4—Cured sheet is lifted from splash. Curing times vary with the resins used, shop needs for production, and type of casting form.

5—Then, by way of getting the jig in shape for final use, its rough edges are smoothed with a power grinder.

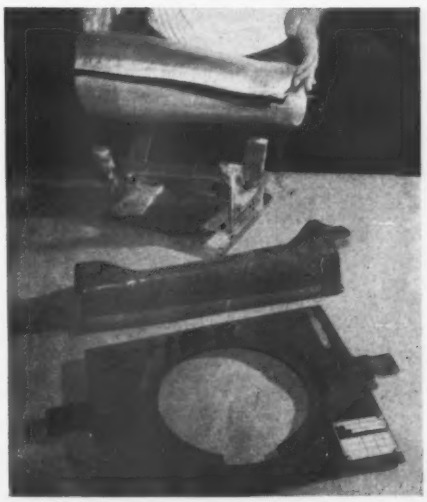
6—And excess material is sawed out to reduce weight and facilitate handling of the completed jig in the shop.

7 (far left)—Here is a drill cage, ready for use. It is being laid over after body assembly of new Convair-Liner 340 nacelle.

8 (center left) — Positioned and clamped, the drill cage guides drilling of holes for Camloc fasteners. Though somewhat flexible, these jigs are accurate.

9 (left)—After body assembly with holes drilled and cage removed. Holes are coordinated with pattern used to drill door assembly, made to fit.

10 (right)—Top: cut-off fixture for trimming and sawing. Middle: drill and trim fixtures. Bottom: a routing form. All made of fiber glass.



Two-way radio to coordinate the activities of 10 locomotives, 10 trucks and 1,000 men over an area of 10 square miles makes operations easier, faster, cheaper in a New Mexico mining pit.

TRUCK CAB—Radio equipment installed in truck with microphone and speaker on dash to right of seat.

LOCOMOTIVE CAB — Microphone just in front of seat does not impair use of locomotive controls.

UNDER TRUCK HOOD—45-ampere generator in truck keeps batteries charged for 24-hour operation.

LOCOMOTIVE ENGINE—80-ampere generator operated off air compressor motor in forward section of cab.

IN CONTROL TOWER (right), operator has microphone and control equipment for selective signalling.

TWO-WAY RADIO

. . . an effective, time-saving industrial tool

TWO-WAY RADIO communication in industrial plants is coming into more and more use. Value of such a system is great; Kennecott Copper Corp., for example, finds that the 21 FM sets installed at the Santa Rita open-pit mine, Santa Rita, New Mexico, bring about the following direct results:

1. *Increased production.*
2. *Better employee morale.*
3. *More efficient operation.*
4. *Faster routing of trains and locomotives.*
5. *Immediate contact with shovels.*
6. *Over-the-air receipt of assay reports, eliminating time-consuming trips out of the pit to secure this information.*
7. *Immediate reporting of accident and injuries, and quicker first-aid and medical attention.*
8. *Considerable time-saving on repair jobs. In case of breakdown of any piece of equipment, repairmen and repair parts are sped to the scene without delay.*
9. *More detailed instructions made possible in communicating blasting operations have reduced the uncertainties and hazards.*
10. *Better coordination — foremen can talk with each other at any time and from any point in the area.*
11. *Reduction of time and travel expense in relaying or delivering messages.*

Operations at Santa Rita consist of the open-pit mine, including a large dump area, an underground mine, a precipitating plant, and necessary shops and administrative units. These operations cover an area about three miles in diameter. Over 1,000 men are employed, and about 50,000 tons of material are mined every day.

Topsy Troubles

When the mining operation started, simple signals by whistle and telephone were adequate. As time went on, though, and the geographic area of operation grew—and the pits grew deeper, the signal system evolved into a complicated hookup of communication depending upon the audibility of train whistles, shovel whistles, and a loud air-blast whistle at the control tower, combined with telephones installed at the five switch points along the haulageway and answered by the switch tenders.

The deeper the pit grew and the farther afield the operations developed, the more difficult and more costly became the communication problem. Finally, and as part of a continuing effort to bring about effective communication means, the idea of two-way radio was decided upon as a probable solution.

To date, 21 sets have been installed, as follows:

1 control tower (stationary)
10 trucks (mobile)
8 electric locomotives (mobile)
1 diesel locomotive (mobile)
1 crane (mobile)

Truck units are operated by the following personnel:

3 pit foremen
1 sample department
1 track department
1 general foreman
1 chief electrician
1 pit superintendent
1 powder foreman
1 electrical trouble shooter

After installation of the sets in the locomotives, a relay set was added in the control tower, which provides for

selective communication with the locomotive engineers and eliminates possible distraction of the engineer's attention by non-pertinent calls. To use the relay set, a special microphone switch box was needed. This microphone switch box also serves the regular stationary set for open communication.

To call a locomotive through the relay set, the operator presses a button switch on the microphone switch box. He is limited to five seconds for contacting the locomotive with the call signal.

If the engineer picks up his microphone, the circuit is closed and conversation between the operator and the engineer can proceed indefinitely. If the engineer does not get the call signal or does not lift up his microphone, the operator at the control tower must repeat the procedure until contact is made.

Installation

Installation costs varied only in the type units where the sets were installed.

In the trucks, the sets were installed by two men in one 8-hr. shift. This included installation of the antennae on the roof of the cab, setting the transmitter-receiver and the microphone bracket, plus necessary wiring and assembly.

The quarter-wave antenna is used for both transmission and reception. It is comparatively short (18-13/16 in. plus/minus 3/16 in.) and is cut to specified length at the factory. Each mobile set in use at Santa Rita occupies 137 in. of floor space and has a total weight of 32 lb.

Installation of similar sets in the locomotives required 24 hr. working time owing to the dual microphone arrangements and innovations made necessary to avoid impairment of the use of the locomotive controls. Extra time was also used in installing the generator and storage battery in the locomotive cab.

Maintenance

Maintenance costs have been very nominal and have consisted chiefly of the replacement of tubes and vibrators which, of course, have a limited life. Some mobile units have had no repair or replacement-of-parts cost during a 12-month period. Spare tubes, vibrators, and other minor parts are kept on hand in the warehouses to expedite repair service when needed.

Equipment

The initial cost of the equipment constituted the major expense item. Company officials state that the initial cost has been repaid many times by the improved communication, which has resulted in increased production as well as a decrease in many other expenses.

Operation

FM radio is remarkably free from interference and clearer than telephone conversation. Electrical installations and equipment do not produce any appreciable static. The sets are easily operated. The operator merely turns the radio on and listens. When he wants to speak, he pushes the "talk" button.

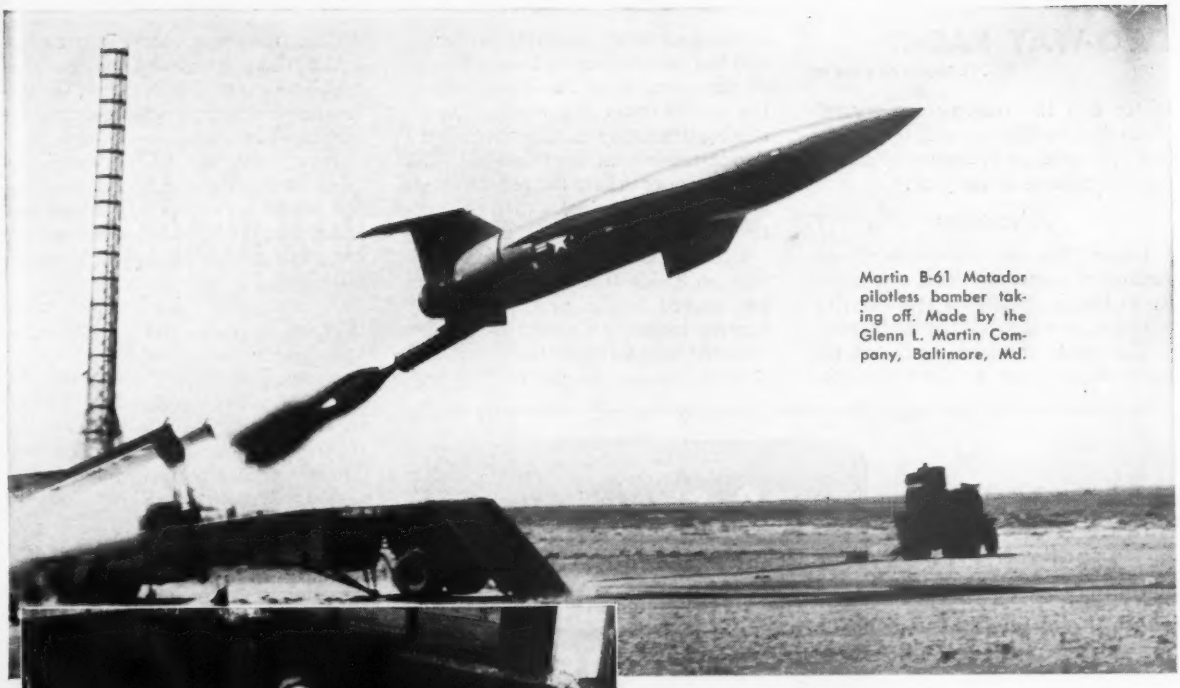
Mobile sets in the automobiles are operated off the regular storage battery. In other mobile units, storage batteries have been installed to provide current for the sets.

Receivers in the mobile units contain 16 tubes, and the transmitters contain nine tubes. Both the trans-

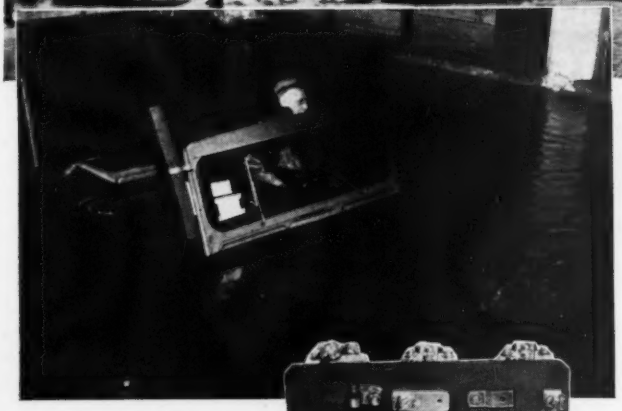
Continued on page 44

THE SANTA RITA open pit mine. Operations over area 3 mi. in diameter include large dump area, an underground mine, precipitating plant, and necessary shops and administrative units. These demands, plus distances, enhanced the communication problems.

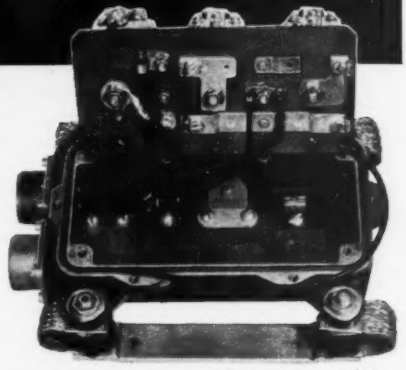
All photos with this article courtesy Bureau of Mines



Martin B-61 Matador pilotless bomber taking off. Made by the Glenn L. Martin Company, Baltimore, Md.



Jeep almost completely submerged. Can be operated in this position at about 9 miles per hour. Made by Willys-Overland Motors, Inc., Toledo, Ohio, for the Armed Forces.



Generator regulator for the 24-volt system of the submersible Jeep. This is completely waterproof and highly resistant to corrosion and fungi. Produced by The Electric Auto-Lite Company, Toledo, Ohio.

Illustrated are two of the many types of capacitors and filters made by Aerovox Corporation, New Bedford, Mass.; an important capacitor supplier to both Electric Auto-Lite and Glenn L. Martin. The unit above is the filter capacitor used in the generator regulator of the submersible jeep while the unit at the right is used in the pilotless bomber.

In the Air— On Land— Under Water—

WHERE REQUIREMENTS ARE SEVERE, CALL REVERE

The dramatic pictures on this page show two important special applications of Aerovox capacitors. One is the Martin B-61 Matador pilotless bomber. It contains an Aerovox capacitor, which has to withstand the terrific acceleration and speed of the craft. The other is the submersible Jeep. Its 24-volt electrical system is completely waterproofed, and includes Aerovox filters and capacitors for suppression of radio interference. Revere not only supplied copper and brass strip for the capacitor cases, but collaborated closely in setting up specifications, and in addition worked on a welding problem. In regard to the latter, an Aerovox Project Engineer wrote: "We have had much better welds." . . . Revere is always glad to collaborate on problems concerning copper and its alloys, aluminum alloys, and electric welded steel tube. Call the nearest Revere Sales Office.

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TWO-WAY RADIO

. . . begins on page 40

mitter and the receiver are crystal-controlled, so that there is never over 0.005% variation in frequency during the four seasons of the year.

Advantages

Under the old whistle-telephone method of communication, one activity in the production of ore—moving of shovels—was carried on as follows:

The bench foreman contacted the assay department to determine the location of waste material in the pit and the ore stations near each shovel. At the same time, the dispatcher in the control tower sent word to the incoming trains by calling one of the switch tenders on the telephone. The switch tender in turn flagged the trains and gave the engineers their instructions.

Often a locomotive was forced to wait on a side track until the shovel had moved to the new location, or another locomotive would have to be rerouted from an upper to a lower level to accommodate the shovel. This procedure frequently resulted in considerable delay of production, most of which was unavoidable due to the system used in communicating among the personnel involved.

Now, with the whistle-telephone-radio communication system functioning smoothly, an operation that previously might have taken an hour to complete can be finished in a matter of minutes.

As in the foregoing instance, when the bench foreman procures the necessary information from the assay department (by radio), he contacts (by radio) all persons concerned—the dispatcher, the locomotive engineers, the shovel operators, and other foremen. The changes are made immediately and simultaneously without delay or confusion.

Foremen can also know at a moment's notice the exact nature of the material at each shovel station, as trips out of the pit to obtain this information from the assay department are now unnecessary.

Plans for Expansion

The success of the two-way radio-communciation system to date has justified expansion plans devised for the whole operation at Santa Rita.

Construction permits have been received for installing two base stations and several mobile units at the company power plant 10 mi. from the pit area. These will be used in case of power-line trouble and for communication between the mine and the power plant.

An operator licensed by the Federal Communications Commission is in charge of and responsible for the approved operation of the industrial station at the mine. In addition, each operator of the base station is licensed under the Federal Communications Act. The station's license is properly displayed in the control tower, as are the licenses of the several operators of the stationary and mobile units.

There have been no interferences, and consequently no complaints, from operators or users of other radio stations and receivers items operate on other wave lengths and frequencies in the area.

Licensing Procedure

Companies contemplating the installation of short-wave radio stations for industrial purposes are obliged by law to meet the requirements of the Federal Communications Act as outlined in Part II, Rules Governing Industrial Radio Service. Copies of these rules may be obtained by writing the Superintendent of Documents, Washington 25, D. C., enclosing 10¢ for each copy requested.

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Better maintenance = increased shop production

. . . thanks to some unusual methods developed in this ceramics plant

BY ADAPTING unusual methods of maintenance to their operations, officials at the Crane-Pacific Division of Crane Company at Colton, Calif., have been able to mass-produce ceramic plumbing fixtures in 186,000 square feet of plant space with a crew of only 200 employees working two shifts daily.

Briefly, production operations consist of dispersing raw clay materials in water, casting the resultant "slip" in plaster molds, and firing or fusing dehydrated slip casts with ceramic-kiln equipment. This is nothing new from a technical point of view; but it does involve the effective application of many production concepts which are by no means standard in the ceramic industry.

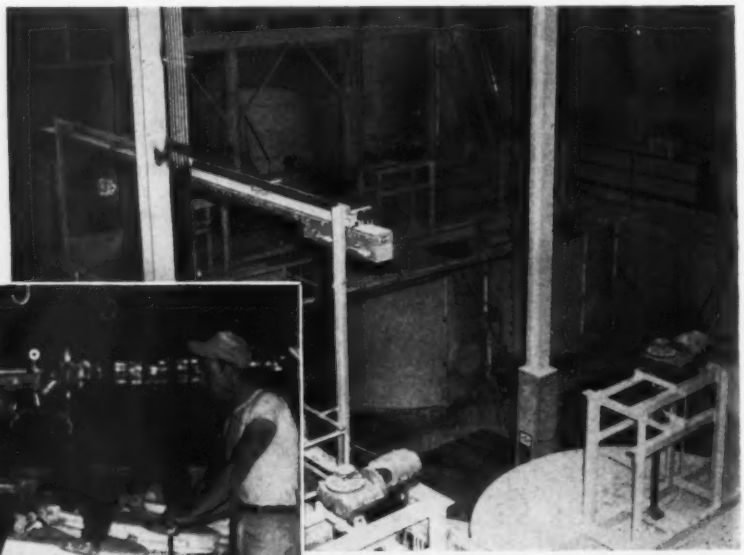
Non-Standard Techniques

For example, where clay slip would normally be prepared with a mechanical agitator in the immediate vicinity of molds for each production item, there is a large centralized slip house with tile-lined tanks for the mixing and storing of raw materials.

This enables specialized personnel to prepare all the necessary casting slip without interrupting production operations when it is necessary to clean tanks, repair mixing machinery, or prepare new batches. Slip can be piped from any one of several storage tanks in the slip house to production stations throughout the plant.

Similarly, where it would be standard practice to align plaster molds on the factory floor for manual loading purposes, roller conveyors pass each mold under an automatic loading fixture which is pneumatically powered so as to fill the mold cavity to a certain level without human assistance.

Roller conveyors of course require a certain amount of lubrication and



CENTRALIZED "SLIP HOUSE" at Crane-Pacific. Here, specialized personnel prepare all casting slip without interrupting production operations. Slip is piped to production stations as needed.

CHECKING plaster molds on a roller conveyor. Molds are pneumatically loaded by a special fixture, which is directly in front of worker at right.

RIGHT—Applying a paste-like mixture of clay slip to upper edge of ceramic toilet bowl to serve as adhesive for assembly of separately-cast rim.

FAR RIGHT—Pneumatic glazing of fixtures.

BELOW—Both overhead and roller conveyors are used to carry slip castings through drying ovens to tunnel kilns.

periodic repairs. However, in addition to reducing the cost of labor in the preliminary loading of molds, they greatly simplify handling problems because their operations are timed so that each mold will reach a suitable unloading station soon after the cast therein is dry enough to be handled.

In order to simplify mold designs and reduce casting defects, arrangements have been made to cast some products as two or more separate parts per unit. For example, the rims and bowls of toilets are separately cast. Parts thus produced are assembled, so that they can be fired as integral articles.

Faster Assembly

A fabric dispenser (which is operationally the same as a toothpaste tube) facilitates assembly work by enabling workers to apply a paste-like mixture of clay slip to the mating surfaces of castings. Purpose of the slip is, of course, to adhere mating parts without producing visible joints after the parts are respectively fused.

Dried casts or assemblies are separated from their molds at suitable clean-up stations, where flash and other casting defects are manually removed or repaired. The unfired products are respectively mounted on freely-rotating turntables at each clean-up station, so they can be handled without damage.

Both roller and overhead conveyors are used to move parts from the clean-up stations and through a pair of drying ovens to the plant's tunnel kilns. The drying ovens are low-temperature units, designed to prevent defects by removing minute quantities of moisture from the casts before they are fired.

Mechanized pallets are used to convey casts through the tunnel kilns, and between trips through the kilns the casts are glaze-finished with pneumatic spray equipment of the type normally used in applying organic coatings.

Extremely small and simple spray booths are used in glazing Crane-Pacific products, since the inorganic coating materials contain no volatile solvents, and glazes are pigmented for color effects before and after firing to avoid confusion among workers in loading parts on mechanized pallets for the tunnel kilns.

Firing temperatures used average 2225° F. for periods of 48 to 50 hours. These are maintained with gas heating accessories during the warmer months of the year in order to minimize operational costs. Oil heating accessories are used during the colder months of the year, when the municipal supply of gas is inadequate for production purposes.

Despite the relative mildness of the climate in the Colton area, this plan is constantly air-conditioned because relatively slight variations in the temperature and moisture content of the atmosphere could cause rather severe discrepancies in finished ceramic products.

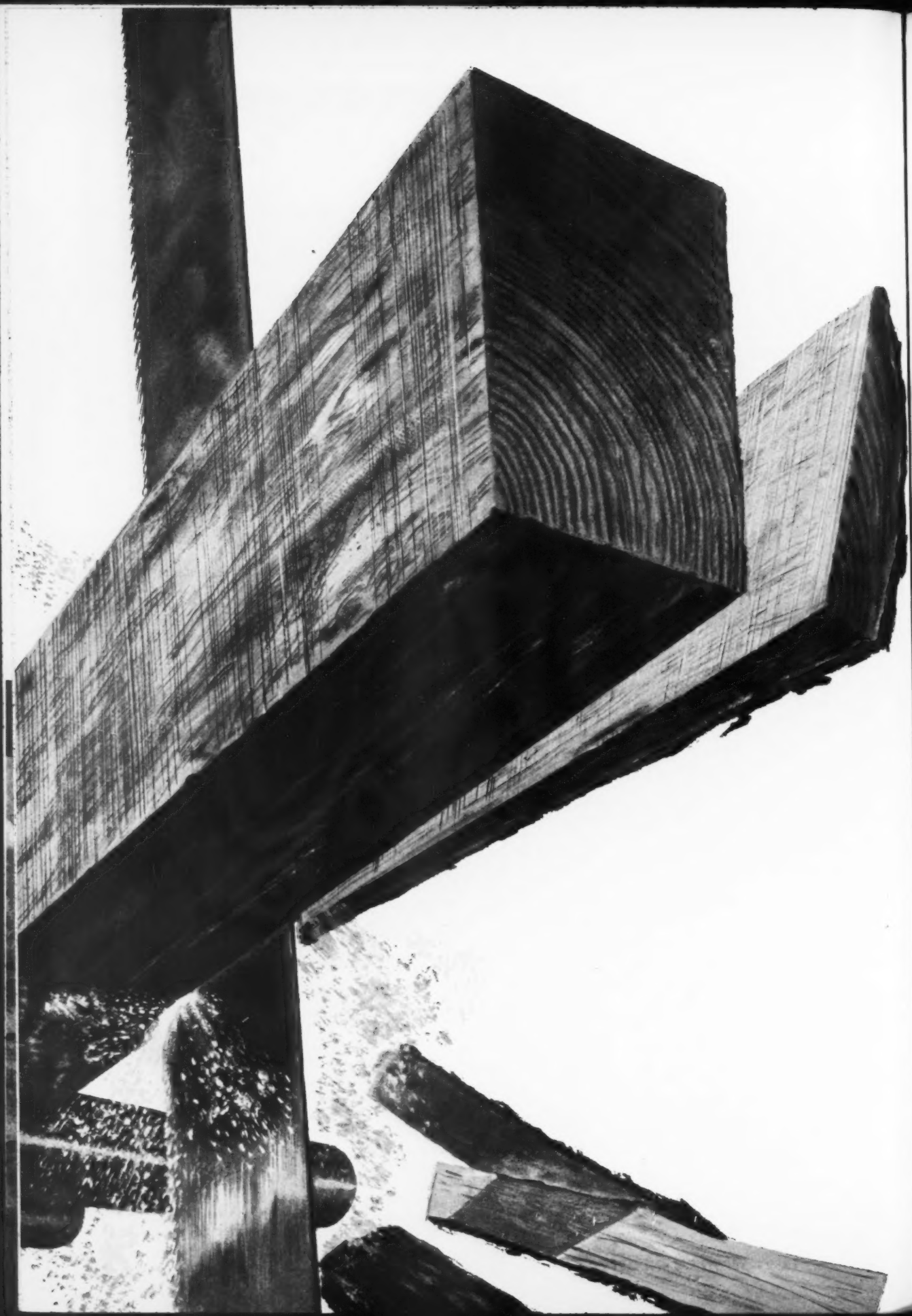
Air conditioning units are serviced at regular intervals in strict conformity with manufacturers' recommendations. Temperature gages throughout the plant are checked hourly to make sure the units are functioning properly. Where a malfunction is detected, production operations are of course halted until the air conditioning equipment is repaired.

Cleaning Problems

Special efforts are made to keep the plant spotlessly clean—a very difficult task in a ceramic shop. Floors are swept at least twice a day; scraps are removed as they accumulate on conveyors, workbenches, etc.; and all facilities are refinished as often as necessary for a good appearance. The principal object of this, according to Superintendent Arthur E. Hock, is to provide the sort of conditions that will encourage employees to take the most pride in their work.

Except for Hock and four other men from the company's Chicago plant, all Crane-Pacific workers have been hired in Colton since the early part of 1951. A majority of these employees had to be trained before they could handle their present jobs, and this would have been a hopeless task if it had been necessary to qualify each new man as a skilled technician.

By using a straight line production setup with more than 6800 feet of overhead and roller conveyors, Hock and his experienced assistants have been able to simplify job requirements so that quickly-trained shop personnel can maintain all operations essential to production with efficiency.



A nontechnical report to management concerning profits

They did what you can do to make money

To turn waste into a salable product is one place management can look for added profits.

This western lumber mill solved the basic problem of "how can the continuous flow of bark and wood best be utilized?". . . but doing it economically in a new plant raised this specific electrical problem:

> "All of the complex machinery, processes and material handling must operate as a unit as well as separately."

Together with plant and construction executives, equipment builders and consulting engineers, Westinghouse *creative engineers* helped supply the answers and most of the major electrical apparatus. This included everything from power and control centers to sectional drives and motors ranging in size from one to 450 horsepower.

Result: A new modern plant that utilizes lumber by-products to turn out millions of square feet of salable—and profitable—hardboard.

This same *creative engineering* applies to every industry, every manufacturing process. It is a part of the total Westinghouse services you can use to your profit . . . for application, installation, emergency or periodic maintenance.

We want to do the kind of planning with you that will apply these engineering services to your problem. . . . to save time, to save money, to make money, to produce more with what you have. Westinghouse Electric Corporation, Pittsburgh, Pa.

YOU CAN BE SURE... IF IT'S

Westinghouse

This brand new newspaper publishing plant at Sacramento, California, is today's proof that new buildings can be good-looking, functional, well-designed, and . . .

AIR CONDITIONED
to satisfy 33 industrial problems

(Fifteenth article in Western Industry's plant construction series.)

THIS MONTH'S plant construction article deals with a newspaper publishing plant (The Sacramento, California *Bee*), and the general offices of McClatchy Newspapers, owners of the three *Bees* (Sacramento, Modesto, Fresno), plus a handful of radio stations in the San Joaquin Valley. This building was selected because it offers diversification of industry to our series, excellent design for the function it satisfies, and a plant that is completely air-conditioned.

All departments in both the administration building and the mechanical building (connected by a common wall) are air-conditioned throughout.

PLANT where employees enjoy work and relaxation. Lounge adjoins cafeteria.

AIR-CONDITIONING SYSTEMS employing refrigeration are designed so that no reheating is required in summer, which results in the lowest operating costs possible.

This is accomplished by use of a hot and cold plenum at the supply fan discharge. The cold plenum is maintained at a temperature low enough to satisfy any one of the various zone supply ducts and the hot plenum handles recirculated room air in summer. The air in the hot plenum is heated in winter only for offsetting building heat loss.

Each zone duct is connected to both the hot and cold plenums and a pair of dampers automatically admit the correct percentage of hot and cold air to the zone duct according to the demands of the zone thermostat located in the conditioned space.

This type of system is quite flexible and as many different temperature conditions can be obtained as the number of zones provided, as desired. In effect, the three double-duct systems installed in the building replace 33 individual systems and final results are equally satisfactory.

Relative humidity throughout is automatically reduced in summer and increased in winter for human comfort. Winter humidification is automatically maintained at a comfort condition by means of recirculated water pumps spraying the cooling coil surfaces over which the air is drawn, all controlled by humidistats.

under automatic control. In addition, hoods and mechanical exhaust are employed wherever heat or fumes are generated in newspaper equipment, and all locker rooms and service areas are exhausted similarly.

Adjustable louvers are provided for all windows having exposure to the sun, to reduce fluctuations in load occurring as the sun's rays travel from east to west. Roof decks are insulated for a similar reason.

Only Clean Air

Every cubic foot of air introduced into the building is filtered and all air circulated inside the building is filtered approximately eight times per hour for removal of dust and pollen. Most air is further cleansed and conditioned by passage through water sprays.

Air is supplied through slotted openings in the top of continuous cabinets located under the windows, so that the exterior walls are blanketed by cooled air in summer and by heated air in winter.

Water from two deep wells is utilized for cooling in several of the air-conditioning systems which handle large volumes of outdoor air. This same water is then re-used in the condensers serving the refrigeration systems. Heat is subtracted from the air and from the refrigerant, and is added to the well water during each step, and the warm water is then wasted.

LOBBY is cheerfully colored and comfortably air conditioned, as well as functional.

The system includes a large well water storage tank with Peerless pumps for power, and Johnson controls for regulating temperature. Well water used for summer cooling may also be used for preheating the outdoor air introduced into the building during the winter. With this arrangement, substantial fuel economy results.

The air-conditioning systems are equipped with recirculated air fans in addition to the supply air fan for the purpose of automatically venting large volumes of air when the systems operate with 100% outdoor air. The recirculated air fans are automatically controlled so that when the outdoor air temperature is suitable for cooling

DISPLAY and general advertising departments, and classified. Note planned order of desks, partitions, and aisles. Removable steel partitions make the department flexible.

the refrigerating plant is shut down and a mixture of cool outdoor air and room air is utilized for cooling purposes.

In the event of any breakdown in the refrigerating systems, it is thus possible to operate all air systems on natural ventilation and to exhaust all air introduced into the building, mechanically. This provision is decidedly important should an interruption in the refrigerating systems occur in summer, and also because common practice is to seal and lock the windows in a fully air-conditioned building for the reduction of dust by infiltration.

PRESS ROOM

The press room is cooled in summer and heated or cooled in winter by means of a central station air-conditioning system handling 100% outdoor air and using well water for cooling. All outdoor air is employed in order to purge the room of ink and oil mist and paper lint originating from press operation. When air is not recirculated, a costly and troublesome maintenance problem is thus eliminated.

Air is supplied at the floor of the reel room (area under the presses for paper storage and press supply) and also through low velocity pan outlets located below the catwalks of the press. The purpose of this low velocity, low-level air distribution is to obtain maximum cooling effect from the air supply. Since all of the heat generated by the press is in the form of friction, distributed throughout the length and height of the press structure, the heat thus generated is permitted to rise unhampered to the ceiling.

When this is done, a large part of the total heat does not affect the room temperature at the operating floor level, but is exhausted directly at the ceiling through roof ventilators arranged for easy cleaning. Conventional air outlets of the mixing type are not used because this type would interfere with the warm rising air current over the press, and would nullify approximately one-third of the additional cooling effect obtained by the use of pan outlets.

In press rooms cooled on the basis of this principle, room temperature reductions of 5 deg. to 7 deg. have been observed. The use of this method has permitted a substantial reduction in system air capacity and consequent operating costs, below that required by conventional design procedure.

A two-speed motor for the supply fan makes possible a 50% reduction in air capacity for economical winter operation and for human comfort, by reducing air movement to a minimum during the winter season.

HEATING PLANT uses natural gas, has oil for standby. Two low-pressure steam boilers.

Two banks of well water coils are installed for summer cooling, one of which is contained in a sprayed coil section for winter humidification. Well water was selected for cooling because it provides a good economic balance between costs and room temperature conditions, where the space requires large volumes of outdoor air to replace the air exhausted, and where high internal heat conditions prevail.

In the present case, it was possible to re-use this same well water for condensing purposes in the refrigerating

THIS TANK (there are two of them) holds 2400 gal. of ink, delivered by tank truck.

systems located elsewhere in the building.

STEREOTYPE ROOM

The same type of supply air system is provided here as described for the press room. Internal heat gains from lead melting and molding machines, mat formers and scorchers, etc., are extremely high and this equipment is provided with specially constructed hoods and direct mechanical exhaust, to contain and relieve as much of this heat as is economically possible. As a result the total exhaust quantity is quite high. The air supplied directly to the room is held below the total exhaust requirements to provide a negative air pressure in the stereotype room so that heat, smoke and foundry odors are localized.

Because most of the personnel here is exposed to equipment having high radiant heat loss, perspiration is unavoidable at any room temperature. Room temperatures approximately 5 deg. or 10 deg. higher than usual are required in this case for optimum comfort conditions. Drafts are guarded against by careful placement and design of the air supply outlets.

COMPOSING ROOM

Full air conditioning employing the double-duct type of system is provided here. Each wall exposure is separately zoned, as well as the interior space. Lighting intensity is high and heat gain from linotype machines is also high, and further aggravated by the usual close spacing of these machines. The nature of the linotype operator's work requires close concentration, and equalization of room temperature without drafts is of paramount importance for a successful cooling application.

Computations for each individual bay were made and the required air volume established by the actual load for each bay in order to secure uniform temperature conditions throughout the area.

Next in importance is the best type of supply air outlet, designed for air mixing and temperature equalization, properly selected so that drafts do not occur. Anything less than the two requirements mentioned will generally lead to an unsatisfactory installation in a composing room.

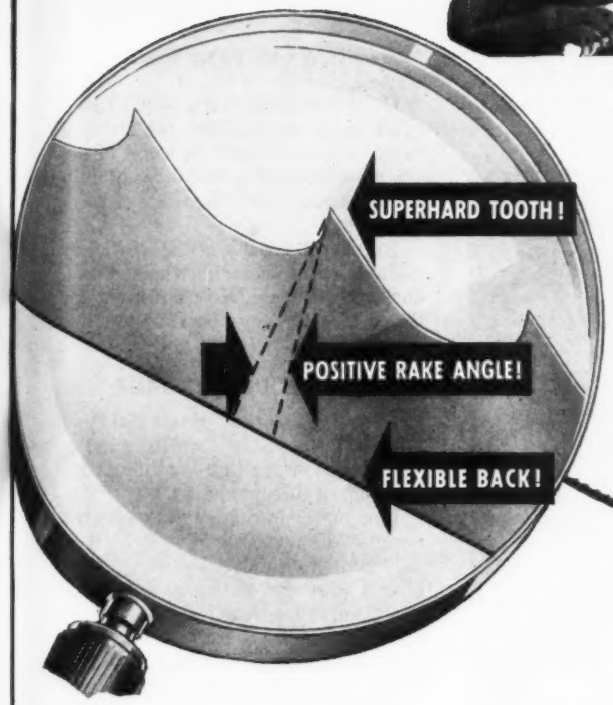
Approximately 50% of the total air supplied to the room is outdoor air. This is required partly to offset direct exhaust from some of the equipment and also for diluting the concentration of oil mist, lead fumes and smoke haze originating in the well-oiled linotypes, which also contain a small pot of

Continued on page 54

NEW!

DoALL CLAW TOOTH SAW BAND...

FOR METALS, WOODS, PLASTICS EXTRA FAST CUTTING, EXTRA LONG LIFE



Widths from ¼" to 1½". 2, 3, 4 and 6 pitch, depending on width.

NOW, for the first time, in the DoALL Claw Tooth saw band, mass production of a blade combining a *positive rake angle, hardened teeth* and a *flexible back* has been achieved.

Faster, free cutting with less feed pressure results from the hooked, claw-like teeth which actually "pull" into the material being sawed.

The superhard teeth give longer blade life with substantially higher cutting efficiency up to time of replacement than that of non-hardened blades which must be resharpened periodically.

The result is a blade that industry has been waiting for—a blade that reduces bandsawing costs and increases production when properly applied.

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DoALL Western Company
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Eliminates Resharpening and Resetting—it's cheaper to replace long-lived Claw Tooth blades than to use blades which must be resharpened a number of times during their life.

Increases Production — more output per machine and manhour because of faster cutting and elimination of blade removal for resharpening.

Cuts Costs—higher production and elimination of blade maintenance labor and equipment means lower bandsawing costs.

DoALL

SB-16

BAND MACHINES SURFACE GRINDERS GAGE BLOCKS GAGING EQUIPMENT MOBILE INSPECTION UNIT

AIR CONDITIONED

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molten lead held under thermostatic control.

Good zone control is a requisite because the heat gain from the linotype machines varies with the speed of operations, from 25% to 100% of full-rated motor and heating element capacity.

Relative humidity is automatically maintained in winter for the standard comfort condition. No fixed humidity is required for any operations in this department.

ENGRAVING DEPARTMENT

A central station air-conditioning system is provided, which handles 100% outdoor air that is required for make-up of direct exhaust.

Full air conditioning was selected because the department is located in the building without exterior exposure. If this were not the case, something less than full air conditioning would generally be satisfactory. As a general rule, persons confined in an interior space during working hours require lower temperature conditions for the same sensation of comfort felt by others who work with windows nearby.

A single duct supplies the entire area. Temperature control is obtained for the various rooms by means of gradual-acting dampers located in the branch ducts and they are automatically controlled by room thermostats according to variations in internal heat gain.

Operations in the etching department require diverse types of direct exhaust and hoods.

Zinc and copper etching machines consist of enclosed stoneware tubs containing acid and a wooden circulating fan, with air inlet slots and an exhaust outlet. Stainless steel ductwork, under suction, is connected to the exhaust outlet and provided with an arrangement for varying the quantity of direct exhaust from the machine. Ductwork must be soldered and the condensation collected and drained.

Powder boxes are table-high enclosures where a rouge powder is used for manual dusting. Velocity across the enclosure opening should be sufficient to contain the powder within the enclosure but not so high that it conveys it into the ductwork.

For best results, a plenum space containing a fine cotton bag filter is built at the top of the powder box and connected to the direct exhaust system. The bag is equipped with a shaker device for maintaining it in good operating condition. Some powder boxes

have a self-contained fan, but in this case also the bag filter is essential for reclaiming the powder and for keeping the ductwork and main exhaust fan clean.

Gas stoves and dryers are hooded in the conventional manner and connected to direct exhaust.

Acid is stored on a prepared section of the floor and against a wall. A stainless steel duct is located against the wall behind the acid carboys and air is exhausted through high-velocity slotted openings in the duct, so that fumes are removed at their source.

Dark rooms for photographic development require direct exhaust located above the sink and a conditioned air supply of less volume than the exhaust, in order to maintain the rooms at a slightly negative pressure.

The camera rooms, where cameras and arc lights are located, are subject to large fluctuations in internal heat gain when the arcs are in use. The arc lights are movable on the camera frame and a satisfactory arrangement consists of locating a direct exhaust register midway of the arc's travel and on the center line of the camera. The direct exhaust is essential where carbon arcs are used and desirable for trapping the intense heat.

In the printing rooms, conditions are somewhat similar to the camera rooms. When sensitized paper is being used, it is essential that room temperature and humidity conditions be controlled and held as nearly constant as possible to prevent stretching and shrinking of the paper while in storage and during the printing operation.

MAIL ROOM

Newspapers are conveyed from the press to the mail room where they are counted, bundled and prepared for mailing and shipping. A central station air-conditioning system using well water provides general cooling and heating year round. No special problems are encountered here, the internal heat gains consisting of some heat carried in the paper from the press, conveyor motors, lights and people.

Air is distributed overhead and evenly throughout the floor, by means of air mixing type of ceiling outlets evenly located throughout the room.

PRESS CONTROL ROOM

Secondary resistors of the grid type, located in fan-cooled cubicles, are used in connection with speed control of the press. The grids generate considerable heat in the building at low press speed, and they are located in a separate room partly on account of this. The cubicles are hooded and vented directly to outdoors. Replacement air is

PAPER must be stored in the proper atmosphere, and moved by husky materials handling apparatus as shown. Air conditioning is important in paper storage.

admitted to the room through louvers in the exterior wall, equipped with air filters.

In this way, the electrical equipment is kept free of dust which would impair its operation and it is maintained at a safe temperature for operation. For economy, the outdoor air used is not heated in winter, since equipment in the room requires infrequent inspection of short duration.

GENERAL AREAS

All departments comprising the general offices are completely air conditioned in summer and in winter, utilizing the double-duct type of system. Each exposure for all departments is zoned and supplied with air from a separate duct having individual temperature controls for both heating and cooling. Each floor level is separately treated in a similar manner in order to maintain the indoor temperature at a constant and comfortable condition.

Certain areas are supplied by a separate zone duct with individual automatic controls because of their nature or to take care of large fluctuations in occupancy. The areas are the recreation room, cafeteria, cooking school, kitchen, museum, conference rooms, first aid treatment rooms, etc. These areas are also equipped with direct exhaust systems for purging the spaces of cooking odors, cigarette smoke, etc.

LOCKER ROOMS AND TOILETS

All locker rooms, similar areas and toilets are provided with direct mechanical exhaust ventilation.

Factual Data

Area	Total Air Supplied	Direct Mechanical Exhaust	Outdoor Air Supplied
Press Room	30,600	32,000	30,600
Stereo	9,000	9,000	9,000
Composing	18,000	4,500	4,500 min.
Engraving	6,000	6,300	6,000
Mail Room	13,000	—	2,600 min.
Press Control Room	14,000	14,000	14,000
Kitchen	—	2,500	—
Locker Rooms, etc.	—	15,400	—
News Room and Circ.	15,000	—	2,500 min.
General Offices	50,000	—	10,000 min.
Totals	155,600	83,700	79,200

NEWS ROOM AND CIRCULATION DEPARTMENT

This entire area is completely air conditioned in a manner similar to that described for the general offices.

HEATING EQUIPMENT

All air-conditioning and ventilating equipment is provided with air-heating coils operating with low-pressure steam and practically all building heating is accomplished in this equipment. All entrance doors from the street, shipping doors and stair towers are provided with direct radiation to prevent cold air from entering the building at these points.

The heating plant consists of two low-pressure steam boilers fired by natural gas with standby facilities so that heavy oil may be burned at a few moments notice, whenever the gas service is curtailed by the local utility company in severe weather. Domestic water is pumped through heating coils immersed in the boiler water and automatically controlled, then stored in tank reservoirs, ready for use.

REFRIGERATING EQUIPMENT

Two reciprocating compressors, direct-expansion type, with step-type unloading controls provide a total of 300 tons of refrigeration for the composing room, the news room and circulation department, and for all general offices. Condensers are cooled by the well water after it leaves well water cooling equipment located elsewhere.

AIR WASHERS

Sprayed cooling coil sections are provided for seven systems with an aggregate capacity of 135,600 cfm.

WELL WATER COOLING

Direct cooling with well water provides a total of 150 tons of refrigeration.

WELL PUMPS

Two deep-well turbine pumps of 200-gpm. and 500-gpm. capacity furnish water for cooling the air systems for condensing purposes and for cooling the stereotype plates.

CONDENSATE PUMPS

Two duplex motor-driven condensate pump units and receivers, each of 15 gpm. capacity, are used for returning all condensate to the boilers.

BOILERS

Two identical steel boilers with

Concluded on page 58

Phister Fire Extinguishers, featuring "all copper and brass construction," are made in a variety of portable sizes and are readily recharged after use. Copper and copper-alloy components provide high resistance to corrosion. Other Anaconda Alloys are used for valve parts, packing nuts, couplings, bushings, gage guards, hose clips, pump parts, etc.

"BUILT-IN" FIRE-FIGHTING POWER *that lasts*

In the home or plant, the cry of "fire" is always frightening, and infinitely more so if the extinguisher fails to work.

Based on several such experiences, and goaded by the conviction that "any fire costs more than a dependable fire extinguisher," founders of The Phister Manufacturing Company of Cincinnati, way back in 1918, decided to design an extinguisher "superior to any on the market" and combining these four *musts:*

1. It must maintain constant air pressure—without pumping.
2. It must be ready to go into operation instantly . . . even after years of disuse.
3. Air pressure and liquid level gages must indicate condition at a glance.
4. Most important, dependable, corrosion-resistant metals must be used to eliminate the most common cause of failures.

Since the first Phister Extinguisher was built to these specifications, there has not been a single record of failure by corrosion.

Over the years, The American Brass Company has supplied Phister with Anaconda Copper and Copper Alloys in many commercial forms, filling precise requirements of corrosion resistance, close-tolerance dimensions and low-cost fabricating qualities. Perhaps our Technical Department could work with you in a similar way? Write The American Brass Company, General Offices, Waterbury 20, Connecticut. Los Angeles 17, Calif.–816 West 5th St.; San Francisco 4, Calif.–111 Sutter Bldg.; Seattle 1, Wash.–953 Stuart Bldg.

3291

You can depend on

ANACONDA

COPPER & COPPER ALLOYS

AIR CONDITIONED

. . . begins on page 50

capacity of 8,500 sq. ft. EDR, SBI net steam rating each, are equipped with submerged domestic water heating coils, operate at 15-psi. steam pressure, and are fired by fully-automatic combination gas and oil burners.

WHO DID IT?

Architect:
Lockwood Greene Engineers, Inc.

General Contractor:

Press Building
H. W. Robertson, Inc., Sacramento

Office Building
Lawrence Construction Co., Sacramento

WHAT WENT IN?

Air Conditioning Equipment
Carrier Corp.
American Blower Co.

Deep Well Pumps—Peerless

Structural Steel—Bethlehem Steel

Roof—Johns-Manville

Floors—Armstrong Cork Co.

Steel Sash
Fenestra, Detroit Steel Products

Louvers—Lemlar Co.

Fire Protection—Grinnell Sprinklers
Gamewell Street Alarm Box

Sound Control
Owens-Corning Acoustical Tile

Water Temperature Controls
Johnson Temperature Controls

Heating—Pacific Boiler Corp. Boilers
F. T. Johnson Oil Burners

Plumbing—Crane Co. throughout

Elevators
Otis Co., passenger and freight
Montgomery Co., freight

Steel Doors
Standard Fireproofing Co.

Steel and Glass Partitions
E. F. Hauserman Co.

Paint—W. P. Fuller Co.

Interior Partitions
Johns-Manville Gypsum

Folding Doors
Modern Folding Doors (Conference Room)

Illumination—Westinghouse Lamps
Holophane Slimlines
Allbrite Fluorescents
Curtis Fluorescents

Electrical Equipment
Underfloor Ducts by Walker
Steel Conduit by National Electric Mfg. Co.
Panels and Auxiliary Switches by Westinghouse
Main Controls by Roller Smith, Panel fabricated by Lakeside Electric & Mfg. Co., Cleveland, O.

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We said: "We have 'em in stock. What size and where should we send it?"

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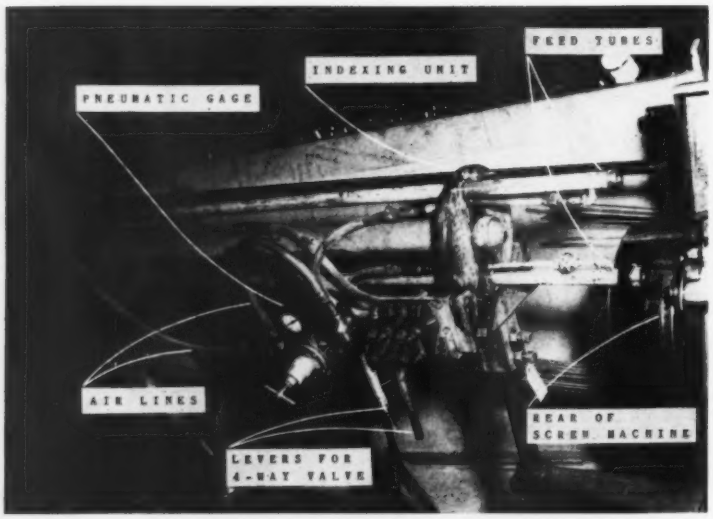
An independently owned and operated company serving Western industry

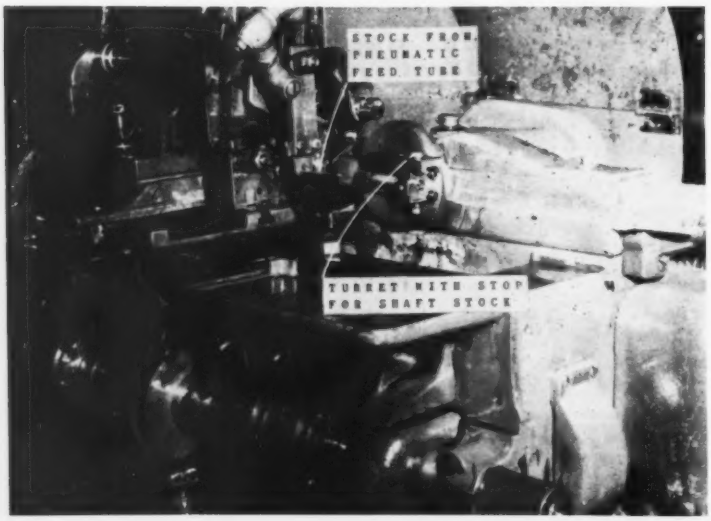
AIR FEED

boosts screw machine production output by 75%



AIR-FEED MECHANISM ▲

▼ FRONT VIEW OF MACHINE



PRODUCTION output of automatic screw machines has been boosted by a margin of about 75% at Clary Multiplier Corp., San Gabriel, Calif., through the use of an air-feed mechanism in grooving shafts from C1117 bar stock.

Shaft stock ranges to ½ in. in diameter, while finished shafts have lengths up to 14 in. Each shaft has a bearing surface and as many as six grooves at each end. Machining tolerances range from ±0.0010 in. for diameters, to ±0.0020 in. for lengths between grooves.

Feed mechanisms respectively comprise two feed tubes mounted on an indexing device, and each feed tube provides housing for a retractable air cylinder which is individually operated by means of the manual lever of a four-way valve providing five lb. of pressure from an air regulator and gauge.

A feed tube is loaded from the front end while it is in the uppermost position, then it is indexed to the lowest position to feed a screw machine from the rear. A special turret on the machine is pre-adjusted by means of adaptor bars so as to provide a stock stop which will maintain the desired lengths of shafts in each different circumstance.

Shaft ends are grooved by means of two separate cutting operations, and a vertical cutoff is actuated so as to finish each part with the desired length. Then, as stock in the lowest feed tube is used to fabricate successive parts, the piston in the upper feed tube is retracted so that it can be loaded by the machine operator and manually indexed to the feed position as soon as stock in the lower tube is exhausted.

Air lines at both ends of the respective feed tubes permit the air-feed pistons to be moved fore or aft by means of the four-way valves, and these movements as well as indexing operations could be cam-actuated by the automatic screw machine if production requirements made a more elaborate mechanism practical.

Circular form tools are placed on both cross slides, alternating with the feed mechanism, and a guide is fastened to the standard swing stock to reduce vibrations. The vertical cutoff is of conventional design.

Generally speaking, the air feed mechanism eliminates most of the time that is normally lost in reloading stock in an automatic screw machine; and, for this reason, Clary officials say it has saved the cost of one man and one machine in daily production work.

The air-feed mechanism was designed for Clary by Lloyd Conlay.

MATERIALS HANDLING & MILITARY PACKAGING

. . . begins on page 36

veloped to provide for a Material Preservation Officer and to attract junior officers to our operation.

Detailed packaging instructions are being developed for every item of Air Force equipment, to be reported in packaging manual. Among the major studies under way is the development of a system of re-usable containers suitable for the movement of the property of TO&E units. Another project is the development of a standard corrosion control line.

Troublesome problems in a chemical plant

By
C. O. BURGIN
Burgin Associates, Inc.
San Francisco

SOME of the troublesome problems encountered in a large chemical plant were as follows:

Two of the products being manufactured and packaged in paper bags were a dusting sulphur and a second compound consisting of sulphur to which had been added a number of chemicals. Both were produced in the same building; production of both was highly seasonal and dictated by sales demands. For instance, one week production would consist primarily of the dusting sulphur; during the next week the mixture would be produced in large quantities.

The raw sulphur used in both products was received in rail cars and unloaded by scrapers operating within the car and spilling its contents into a hopper at the door; the material was then conveyed by a screw conveyor into a building where a pile 18 ft. high was maintained as inventory. It was taken from this pile to the grinding and mixing machines by a fork-lift truck equipped with a hydraulically operated scoop.

After the sulphur had been processed into either product, it was bagged, loaded five bags high on large wooden pallets, and transported to the warehouse close by. Here the pallets of dusting sulphur were stacked four high; the pallets of the mixture could not be stacked on top of one another for 24 hours because the extra weight caused the contents to cake.

Caking was not desirable from a sales standpoint. However, after the pallets had remained on the floor one pallet high for a period of 72 hours, they could be stacked three high in storage.

The varying production rates created a variation in the total amount of material and the amount of each type to be stored in the warehouse. Volumetrically, the warehouse was capable of handling the tonnage if all of the storage cube could be utilized.

The problem of using the available volume was solved by recommending spindle pallets for the sulphur mixture, so that it could be stacked four pallets high at the time of manufacture and thus leave sufficient room for storage of the dusting sulphur. This permitted utilization of the warehouse volume to the fullest extent and also reduced the use of the lift truck.

Another problem involved handling 147 different products and packages from the production machines to the warehouse. A tremendous increase in business had made the original warehouse facilities inadequate for the maximum inventory that was necessary to provide for seasonal sales demands. An interim solution was provided prior to eventually enlarging the warehouse.

At the time of the survey, the finished packages moved from the production area by a belt conveyor, which

was elevated a few feet off the warehouse floor, through the supply section into the warehouse. The conveyor interfered with the operations in the supply storage area and the warehouse; it prevented efficient use of space in both areas. In order to balance the flow of material from production to shipping, we recommended (1) elevating the conveyor to the extreme height that the trusses would permit, and (2) extending the belt conveyor down through the center of the warehouse to the end wall. At this point, we recommended the conveyor be dropped to the floor level where the packages could be palletized without hindering operations in either the warehouse or supply section.

This solution permitted full use of the warehouse for storage and selection. It was laid out with six-ft. aisles and an assembly line in the center for selecting the packages required by each customer's order. A straddle truck, electrically propelled, was recommended for handling the pallets within the warehouse. Electric transporters were suggested for the order assembly line. Selection was to be made directly to the pallet.

Production was seasonal in character and the two original production lines were being operated almost continuously during the first six months of the year. It was obvious from the data accumulated that the warehouse was overburdened because of the unbalanced conditions existing in the production section. Installing another production line (1) permitted reduction of the warehouse inventory to a minimum consistent with sales, (2) made use of the warehouse as a distribution section only.

Pitfalls in bidding on government contracts

By

RALPH C. BUTLER

General Manager
Aircraft and Export Packaging Division
Lyon Van & Storage Co.
Burbank, Calif.

FIRST, the contractor should employ someone familiar with government specifications to interpret his packaging requirements as called out on the invitation to bid. If the contractor has a small organization and cannot afford to employ such personnel on a permanent basis, he can call on a reliable packaging company to furnish him assistance in preparing his bid. Usually this service is furnished without charge.

Second, do not submit a bid based on employing shop carpenters, maintenance, and/or excess labor to fabri-

cate the containers, because they often think the container specifications are trivial. Rejections by government inspectors after the containers have been built can be a very significant item in the packaging cost.

Employment of inexperienced personnel in the fabrication of containers can result in container rejection for any one of the following reasons:

1. Too much moisture in the lumber.
2. Divergence of grain in the lumber.
3. Lumber not of proper quality as to grade or thickness.
4. Wrong size nails.
5. Nail pattern incorrect.
6. Box design not correct for type of load.
7. Box liners not installed before items were packaged.

If the contractor, at the time of submitting his bid, employs a competent and experienced packaging engineer to interpret correctly the government specifications, this pitfall can be avoided. The small cost of expert advice will more than offset the cost of possible repackaging and/or rebuilding of shipping containers.

Third, do not miscalculate the cost of interior packaging from the standpoint of either labor or materials. Check thoroughly on the cost of setup boxes and cartons, especially if the contract requires procuring in small quantities.

Foil barriers for interior packing are another pitfall, because of the costly and slow laboratory tests required for sample bags. It is usually more economical for the small contractor to purchase these foil barriers from a source of supply approved by the Armed Forces.

Cyclic exposure and drop tests, when required, can also substantially increase the cost of packaging.

One of the most frequent miscalculations is failure to include the shipping or carloading costs.

Transition from mobile to conveyorized handling

By

R. H. EDGECUMBE
Chief Industrial Engineer
Virtue Bros. Manufacturing Company
Los Angeles

THIS PROBLEM involves the movement of packaged furniture from the final assembly lines in a main manufacturing building across a 61-ft. roadway to a proposed warehouse building. The packages weigh a maximum of 125 lbs. and have a maximum dimension of about 36 in. Up to 3,000 units must be transported to storage per 8-hr. shift.

Since lift trucks, motor trucks and people use the roadway constantly, transporting the material by lift truck could be highly inefficient and hazardous. One truck would not do the job and the labor cost would be prohibitive.

An overhead trolley conveyor was ruled out by a city building restriction specifying a 60-ft. easement between the buildings, and the only possible alternative was a conveyor under the roadway between the two buildings. The expense of this could be reduced by digging the tunnel and the warehouse foundation at one time.

A 36-in. wide flat belt roller bed conveyor proved the most practical solution. The one we installed runs through a seven-foot square reinforced concrete tunnel with its floor nine feet below the roadway. It follows a 10-ft. horizontal path at the loading point in the manufacturing building, drops down a 25-ft. long slope into the tunnel, extends 62 ft. through the tunnel, rises steeply up an 18-ft. long slope into the warehouse building and then travels 10 feet farther horizontally. There are two 100-ft. long lines of gravity roller conveyor at either end of the belt, for loading and unloading.

The final assembly and packing lines were swung around to a convenient off-bearing point where men boxing the units can also place them on the conveyor. At the end of the conveyor in the warehouse two unloaders

remove the packages from the conveyor, stack them on pallets and warehouse the pallet loads.

This installation in operation has eliminated our difficulties and has showed a direct labor saving of $12 a day. We recognize that further improvements will facilitate unloading and storing in the warehouse, and some thought is being given to automatic stacking devices and similar equipment.

DIRECT LABOR REPORT OF SAVINGS

	Std. Hrs./Unit Before	After	Increase Decrease
Off Bearers	.2464	.2444	—.0020
Lift truck operators.....	.0039	.0009	—.0030
Warehousemen	—	.0027	.0027
Net savings per unit			—.0023

.0023 (Savings/unit) @ $1.75 (Base Rate) = $.0040 @ 3000 (Units/day) = $12.00 Savings/day.

—Normally followed by a report of Installation and Change-over costs, and finally a statement of amortization.

Navy packaging policy

By

LESLIE C. HELLER

Vice-Chief, Packaging Section
Office of Naval Material

WE FEEL it is essential that industry should be kept in the military packaging business, so that material delivered to us can be stored, handled and reshipped with a minimum of effort. We are also looking ahead to the future, so that we can avoid the difficulties of World War II, when so much material was worthless on arrival because industry was not up to date on military packaging.

Our supply system involves longer periods of storage, more handlings and danger of rust and corrosion than ordinary commercial business. So to obtain uniform application of Navy basic policy, it was decided early this year to issue an official interpretation, covering particular "best commercial practice" and "Consolidated Freight Classification rules."

Our interpretation is that "commercial practice" in preservation and packaging may be considered adequate when it is *definitely known* that the item is required for immediate use by a domestic receiving activity. When it is definitely known that the item will be so used within 180 days and will be in covered storage throughout this period, the level may be lowered to a point consistent with the anticipated hazards of shipment, storage and handling. Instead of using the term "Com-

mercial Practice," specific language will be used in the procurement document to cover the specific situation.

When *definitely known* that material is needed for immediate use by a domestic receiving activity, packing in compliance with "Consolidated Freight Classification rules" may be considered adequate. For all other material this term or "Commercial Practice" may not be used, but packing and containers shall conform to Federal or military specifications or shall have the technical approval of the procuring authority.

Military marking, testing

By

RAY PASS

Chief, Packaging Section
Quality Control Directorate
Western Air Procurement District
Los Angeles

REINSPECTION requirements provide that, when applicable, the contractor must mark each container with the inspection date for preservation. Provisions for omission of case liners in export shipping boxes appear to be more liberal than on the old forms. Domestic shipping containers must conform to certain listed Federal specifications, unless otherwide specified, whereas containers built to meet Consolidated Freight Classification rules were formerly allowed.

Maximum gross weight for a Type 1 load shipped domestically in fibre containers was formerly 70 lbs.; now no gross weight is mentioned, therefore the weight may equal the load as specified by the manufacturer's seal. This is not to be confused with the 275-lb. Mullen Test requirements.

Tests for preservation are required on pilot packs, routine production packages and packages utilizing different basic methods.

Use of time lapse camera

By

A. J. ROWE

Assistant Professor of
Industrial Engineering
University of Southern California

THE TIME-LAPSE camera provides the answer for an accurate, rapid and inexpensive method for the analysis and timing of group or crew activities as compared with the expense and tediousness of individual and interruption-type studies. It takes a picture once every 1/100 of a minute, in contrast to the normal speed of 16 frames per second. This allows 100 ft. of film to last 40 min., rather than the normal four minutes.

It is relatively inexpensive since the film is run at a much slower speed than normal. The film provides a permanent record which can be reviewed at a later date by other observers or union men.

Once the camera is started, the observer is free to make any other observations necessary, since he does not have to watch the camera or the crew. The camera is driven by a synchronous motor which provides accurate timing of the film so that it can be used both for analysis and for establishing time standards. The data can be very easily charted from the information obtained from the film.

The actual procedure to be followed in taking the film is similar to ordinary motion picture work. The operators should be informed that not only are their pictures being taken, but that the camera is also recording the time for the operation. Care must be taken to see that the proper lighting is used. It is necessary to use a wide-angle lens so that a large area will be covered which is necessary in crew operations. Once the camera is started, no further attention is generally required until the film has been used.

A loading operation was photographed in which there was a three-man crew. Two stackers were putting cartons in place in a freight car, and a fork lift truck supplying the material to the stackers. The film shows the relative activity of the three men and the delays or waits when someone in the crew did not have a proper work balance.

The analysis of the film can be used for methods improvements, better work balancing, and for establishing the time standard for that particular loading operation. The film can be reviewed at normal speed and will show 40 min. of work in four minutes time, which saves the time of supervisors or others who look at the film. Thus, with a small amount of film and in a short time both the analysis and time standard can be accomplished.

Crane, monorail problem

By

J. E. OWENS

Plant Engineering Supervisor
Douglas Aircraft Company, Inc.
El Segundo

PROBLEM involves the overhead handling of materials in loads up to six tons. The building, in which the work is to be done, is of masonry walls and steel framework. Shape of the building is rectangular and is 320 ft. wide by 960 ft. long.

Insurance requirements made it necessary to divide the building into four sections by means of interior masonry walls; each section being 240 ft. long and 320 ft. wide. Each section consists of columns on 20 ft. by 60 ft. spacing and a clear height of 25 ft. to lower chord of truss. Thus, each section has four bays of 60-ft. column centers.

There is one center aisle down the building 20 ft. wide and 960 ft. long. At each firewall, there are two self-closing motor-operated fire doors.

There is a truck unloading dock in one end of one section. Problem of handling to transport load to any portion of any other section.

Solution could not be accomplished with any of the standard monorail bridge crane systems, using interlocking bridges.

Since more than one crane would be traveling through buildings in the various sections, the only known solution was a monorail bridge crane with swiveling end trucks and motor-operated turntables. The motor-operated turntables were placed along center aisle the long way of the building. Four turntables in each 60-ft. bay along main aisle throughout length of building provide full coverage.

LABOR-MANAGEMENT COUNCIL is a springboard for action

Here's proof that these two groups can exchange views, reach agreements and speed progress—At Pacific Electric, accomplishments have come thick and fast

DURING the past two years since its re-establishment, the Labor-Management Council of Pacific Electric Railway Company has become a sounding board where both labor and management can exchange views and reach a middle ground where points of difference are understood, minimized, softened, and points of agreement are emphasized, becoming springboards for united action. While the Council works only by making recommendations to the proper authority, it has attained objectives which might otherwise have taken years to accomplish—if they were accomplished at all.

The Council Make-up

On March 30, 1950, the Conference Room, 465 Pacific Electric Building, Los Angeles, was the scene for re-establishment of the Management-Labor Committee which had been active during World War II. Eleven management and nine labor representatives participated with high hopes for a cooperative committee resulting in a greater understanding between management and brotherhoods, increased job security, increased revenue, and improved Pacific Electric standing.

Under the new Labor-Management constitution, the Council is headed by two co-chairmen, one from management and one from labor who take turns at regular meetings held on the last Thursday of each month.

Suggestions and recommendations stemming from the Council have resulted in the following accomplishments shown in the minutes of Council meetings since reorganization:

Supervisory training classes in transportation, mechanical and engineering departments have been initiated.

Through cooperation of the University of California at Los Angeles, at its downtown classrooms on Hill St., an extension course, "Transport Management-Labor Relations" was started in the fall of 1951. Ending the following June, the course was well attended by both management and labor. Representatives from both groups addressed the students.

Accomplishments

A courtesy campaign was inspired and expanded including a series of posters offered by the Brotherhood of Railway Clerks aimed at increased civility toward travelers and shippers.

Conversion of an old motor coach by Torrance forces of the mechanical department makes Pacific Electric ready and willing for anything from public relations films through supervisory training classes to a go-to-the-polls-and-vote campaign.

Better understanding between labor and management has been promoted through invitations exchanged and accepted to attend each other's meetings.

Management - Employes Charity Chest Association funds are so allo-

Concluded on page 70

HERE'S THE COUNCIL at Pacific Electric—nine labor representatives and eleven men of management, meeting once a month.

for steel and aluminum

SERVICE

for
steel
aluminum
magnesium

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WE BUILT THE WORD "Service" with steel and aluminum to draw your attention to our complete facilities for sawing, shearing, burning, slitting, roller leveling and cutting. Without diets or drugs cut your wastage . . . rely on you know what for steel, aluminum and magnesium. Call ADams 6133.

RELY ON RELIANCE

STEEL COMPANY

2068 EAST 37TH STREET, LOS ANGELES 58, CALIFORNIA

LABOR-MANAGEMENT

. . . begins on page 68

cated that a member of MECCA, affected by cancer or tuberculosis and showing need for financial aid, may be helped above and beyond the scope of Hospital Association rules.

A system-wide blood bank program to build P. E. Blood Bank credit at the Red Cross and to aid our men in Korea is constantly being carried on.

A freight protection department has been newly organized emphasizing the importance of taking every reasonable effort to conserve railway revenues and to eliminate avoidable loss and damage.

Better Working Conditions

A sub-committee has been formed, composed of two representatives of labor and two of management to consider employee working conditions.

In several departments, medical releases are no longer required from employees wishing to return to work after illness. Similar rulings throughout the organization are expected to follow shortly.

On April 28 a system-wide enlistment of operators, as well as repair and maintenance forces of the mechanical and engineering departments, in the civil defense program was started. By June 1, nearly 580 employees had enlisted for emergency service.

Improved Bulletin Board

An improved bulletin board system keeps employees up-to-date on all new ideas and programs with noteworthy results.

A policy regarding lost employee passes has been instituted, making the waiting period between report of loss and issuance of new pass a uniform two months in every case.

A stronger community relations program has been set up by revision of company-sponsored employee memberships in chambers of commerce and service clubs.

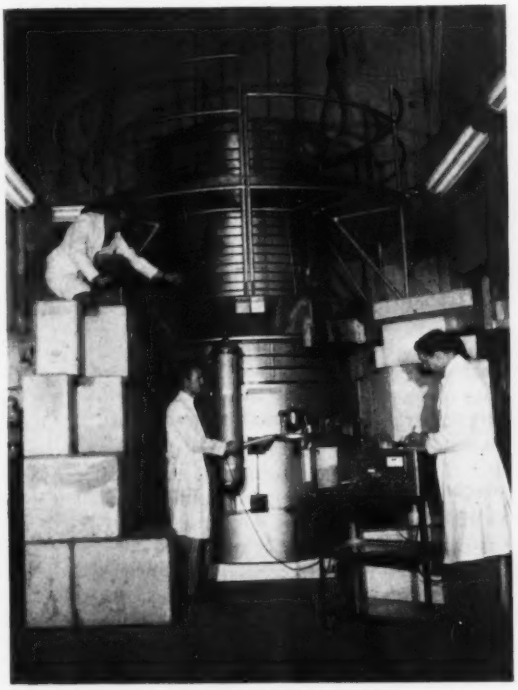
Rumors Pinned Down

Unsettling rumors within ranks are stopped before they start by cooperation of management in keeping employees informed in advance of contemplated policy changes.

And, finally, through Council efforts, greater support is now given to defense bond campaigns.

What does it all add up to? . . . Harmony and progress brought about by cooperation and unified action on the part of both management and labor . . . proof that it can be accomplished . . . Pacific Electric's Council has done it.

"Baby" reactor at North American will be used for research



ENGINEERS at North American Aviation's Atomic Energy Research Department measure the background radiation level around the water boiler type atomic energy reactor. Concrete blocks, used to shield the reactor have been removed, showing the tank-like housing where the graphite reflector and core are located. Superstructure is not a part of the reactor, but is one of the many test units which can be used with the water boiler for experiments and study in the field of reactor development.

THE FIRST ATOMIC energy reactor to operate in California is now working at North American Aviation's Downey plant. Designed and built by the firm's Atomic Energy Research Department under contract with the Atomic Energy Commission, the water boiler neutron source, or "baby" reactor, is being used to further the development of reactors and associated projects.

Although the water boiler reactor at North American is quite small in comparison with reactors for producing fissionable materials or useful power, it will be valuable for obtaining information for use in designing improved small-sized reactors for various industrial purposes.

The water boiler is the vital part of a facility for making reactor physics measurements that will guide reactor development. The water boiler neutron source will supply the neutrons needed for these measurements.

Exterior of the reactor, pictured above, is shielded by a housing of 2-ft. thick concrete blocks. The concrete surrounds a cylindrical graphite reflector 5 ft. in diameter and 6 ft. high, formed by stacking graphite bars horizontally inside a steel tank. The reflector surrounds the reactor core, a stainless steel sphere one foot in diameter.

The production of atomic energy takes place inside the sphere which contains a Uranium 235 enriched uranyl nitrate solution. It is from the nuclear fission of the material in a water solution that the reactor derives its power—and its name "Water boiler."

Although the water boiler was built primarily for reactor research, associated studies in atomic energy technology can also be performed with applications to industry.

BOOKS FOR INDUSTRY

"Handbook of Engineering Fundamentals"

Second edition of "Handbook of Engineering Fundamentals," edited by Dean Ovid W. Eshbach of Northwestern Technological Institute, is issued by *John Wiley & Sons, Inc.* All phases of engineering are thoroughly covered in this reference book to which 39 distinguished scientists have contributed material. Manual includes engineering tables on such items as standard structural sizes for aluminum, as well as data on tangents and offsets for use of civil engineers. This 1,324 page book is priced at $10.00.

Industrial dispersion guidebook for locating defense plants

U. S. Department of Commerce publishes a guidebook to help communities and manufacturers select sites for new defense supporting plants which will afford relative security from enemy attack. Book, which is priced at 20c tells what data and maps are needed and where to get them; how to identify highly industrialized and densely populated sections and potential target zones, and other procedures the manufacturers should follow.

Helpful info on uses of porcelain enamel

Porcelain Enamel Institute booklet, "101 New Uses for Porcelain Enamel," is now available to all interested manufacturers and individuals. The range of product suggestions is highly diversified, ranging from hog feeders and ship bulkheads to various types of hoppers, housings and jet engine parts. Copies are on sale for $6.00 each.

Data on investment process in precision metal castings

Latest technical methods in use in the "Lost-wax" or investment process for producing precision metal castings are presented in a report just released by Office of Technical Services, U. S. Department of Commerce. Especially valuable is an extensive bibliography which lists literature references, U. S. Government reports, and books on this and related casting methods. The 13-page brochure sells for 25c a copy.

All about distribution and marketing in a mobilization period

A stenographic brief of an address given before the *California Personnel Management Association* and the Personnel Section of the *Western Management Association* by Stokes Tomlin, distribution engineer, *Shell Oil Co.*, discusses distribution and marketing in a mobilization period. Copies cost $1.00, and text is published by Research Division, California Personnel Management Association.

Dollar books on engineering subjects

Newly revised data books on various engineering subjects are now available from Lefax, publishers, in a Dollar Data Book series. Fields covered include: aeronautics, air conditioning, refrigeration, diesel engineering, pumps and turbines, machine design, mechanical drawing, metals, piping data, power transmission machinery, and welding data. Books contain about 140 loose leaf pages of up-to-date information.

HELPFUL LITERATURE

for the plant operator who wants to keep informed

1

252-page reference book on cutting tools and abrasives

A handsome, illustrated 252-page catalog is available from *Pacific Abrasive Supply Co.* of Los Angeles, San Francisco and San Jose. It is crammed with information on every high quality abrasive and cutting tool under the sun. A reference work to make every abrasive user's job easier, it contains detailed descriptions, prices and other useful facts and figures. Circle key number on postcard and a Pacific Abrasive sales representative will supply you with your free copy.

2

Giving the best answer to most hard water problems

An advanced method of conditioning most waters and fluid mixtures is introduced in a bulletin now available from *Evis Manufacturing Co.* Bulletin tells how process can be applied directly to any piping system, explains why there is no need for chemical additives or renewals, and gives specs, prices, recommended installations. Circle key number on postcard for your free copy.

3

A guide to in-plant design and materials use efficiency

A booklet from *Defense Production Administration* tells the "how" and "why" of setting up a program for in-plant conservation. It tells what steps to take toward the goal of more efficient design and materials use through standardization, simplification, substitution, salvage and reclamation.

4

Guide for lathe testing

The lathe user can now check his machine against minimum standards of accuracy and alignment in a new guide published by the *American Society of Mechanical Engineers.* Every phase in the testing of 12-in. to 72-in. lathes is covered in this guide. Key number on postcard will bring you your copy.

5

Fabrication manual for welded steel tubing

Armco Steel Corp. publishes a new 28-page manual on "How to Fabricate Welded Steel Tubing." Booklet consists of ten major sections—cutting, deburring, bending, swaging, special tube-end forming machines, punching and notching, drilling, joining, cleaning and finishing. Each subject is treated in a concise, practical manner with special emphasis placed on "how to do it and what to do it with." A good reference work for both experienced and inexperienced fabricators. Circle key number on postcard for your free copy.

6

"25 Questions and Answers about NAF"

The National Association of Foremen has for you a new informative booklet on its policies and functions.

7

Some new ideas on centrifugal refrigeration

Quarterly publication of *Electric Machinery Co.* deals with application of AC motors to centrifugal refrigeration compressors. Lead article discusses refrigerant characteristics, compressor capacity control, motor characteristics and control. Additional articles cover other phases. Two-color magazine includes charts and tables of helpful engineering information. Circle number on postcard for your copy.

8

Guidebook to abrasives

Gardner Machine Co. puts out a new 60-page book containing helpful information for users of abrasive discs on surface grinding operations. Illustrated with pictures and sketches, pocket size makes it handy for reference. Contents include abrasive fundamentals, selection information, types available, standard markings, spindle speeds, coolant selection, dressing, safety, grinding various materials and care of discs.

9

Handbook of welding techniques

Eutectic Welding Alloys Corp. makes available a 64-page illustrated book on latest welding developments and techniques in this field. Over 100 photos, drawings, charts and diagrams are included.

10

Tire guidebook

A 12-page industrial tire handbook is available from *B. F. Goodrich Co.* Booklet shows complete Goodrich industrial tire line, explains service to which each tire should be put and gives maintenance tips on care of industrial tires.

11

Executive personality discussed

A four-page folder discussing personality factors in executive development is published by *The Harold F. Howard Co.*, management and engineering consulting firm. Folder includes information on basic points of executive development programs, appraisal and selection of executives for development, personality testing, etc. Circle key number for your free copy.

12

Color analysis booklet

"Color Analysis and Its Use" is an engineering bulletin made available by *Panama Lamp & Commercial Co., Inc.* Its final chart showing seven "white" fluorescent lamp colors recommended in various applications, can serve as a simple and practical guide for any fluorescent lamp user.

13

Automatic pallet loader described

Lamson Corp. issues a 16-page bulletin describing its newly developed automatic pallet loader. Pictures and sketches show unit in operation.

14

Cost check chart for polishing and buffing

E. Reed Burns Mfg. Corp., makers of polishing and buffing compounds, offer this chart for accurately determining cost of polishing and buffing operations. Neatly laid out with the idea of determining most efficient and economical compounds for each particular operation, you simply fill in figures indicated on the card and, from them, actual net cost is readily computed. For your free copy, circle key number on postcard.

15

A study in engineering economics

Battelle Memorial Institute has published a booklet describing its research in engineering economics which is available to our readers. The Institute's research covers six fields: industrial market research, raw materials studies, diversification studies, research planning, industrial logistics and plant location, and operations research. This one is a "must" of industrial planners.

16

Handbook on insulation of metal buildings

Owens-Corning Fiberglas Corp. engineers have prepared this booklet to illustrate their point that metal structures need not be hot as ovens in summer and cold as the great out-doors in winter. Complete details of insulations for every metal building need are listed.

17

Bearings for all service and production needs

Bunting Brass & Bronze Co.'s latest catalog is now ready. Listed are 854 sizes of standard stock bearings from 3/16-in. to 4½-in. inside diameter in a range of outside diameters, 324 electric motor bearings and 263 sizes of tubular and solid Bunting precision bronze bars. New sizes have been added to lists. For your free copy, circle key number on postcard.

18

Automatic controls offer solution to door problems

Automatically operated doors increase productivity, service, good will, and profits, according to the Magic Door division, *The Stanley Works*, New Britain, Conn., who have prepared a 16-page brochure on the subject. Technical details are illustrated, pictures show installations and uses, and specific information to help you solve your door problems is offered in this publication, AIA file No. 16-D.

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San Francisco 5, Calif.

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2. For more information on **NEW MATERIALS AND EQUIPMENT** previewed on following pages, circle key numbers.
3. For complete information on **PRODUCTS ADVERTISED** in this issue, fill in page number and name of advertiser.

Send free booklets and more information on new products listed under circled key numbers:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

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21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

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Organization.....SEPT. 1952

New products and manufacturers' booklets reviewed in *Western Industry* are screened and selected for your needs. The advertisers in *Western Industry* call your attention to important services and developments available to Western firms in this period of dynamic growth. Take this opportunity for aid in keeping your business in step with this growth.

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BUSINESS REPLY CARD
First Class Permit No. 3755, Sec. 34.9, P. L. & R., San Francisco, Calif.

WESTERN INDUSTRY

609 Mission Street

San Francisco 5, Calif.

19

Floor maintenance handbook

"Your floors and how to maintain them" is a packed-with-information booklet available from *Multi-Clean Products, Inc.* Subjects covered include importance of proper floor care, asphalt tile, concrete flooring, terrazzo and magnesite, rubber tile, wood flooring, linoleum and shampooing carpets and rugs. Detailed information is included on methods, products and usage. For your free copy, circle key number on postcard.

20

Precision aircraft equipment

Adel, a division of *General Metals Corp.*, has a 2-color booklet picturing and explaining its hydraulic, pneumatic, heater, anti-icing and fuel system equipment. Publication goes into engine accessories, special equipment and line supports. Outlined and illustrated are Adel's outstanding special production and testing facilities.

21

A case study in mechanized accounting

Remington Rand, Inc.'s new folder points out that office mechanization is as necessary as plant mechanization because antiquated methods and equipment can not keep up with modern factory production. Complete operation of company's accounting machine is described in folder with illustrations of actual forms used.

22

Plastic glazing to reduce window breakage

Rohm & Haas Co. now has an informative two-color booklet on "Window Glazing with Plexiglas." It is written for plant maintenance engineers, architects, and maintenance superintendents of office buildings and schools, who are confronted with frequent breakage of windows or other glazing problems involving high labor costs.

23

Electric tool catalog

Ingersoll-Rand Co. publishes a 36-page catalog covering its line of Multi-Cycle electric tools. Sections are devoted to impactools, nut runners, drills, screw drivers, grinders, buffers, sanders and polishers.

24

Job study illustrates warehousing economies

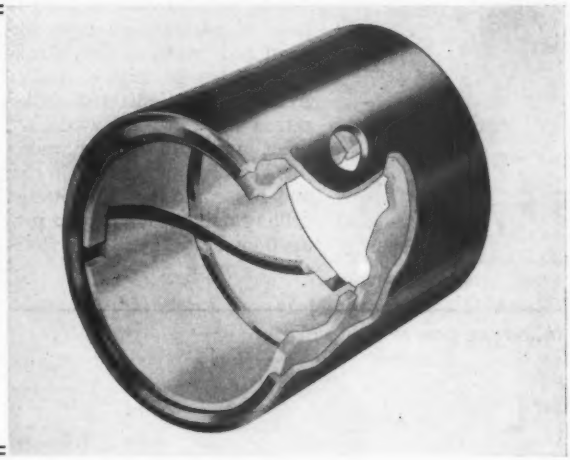
Cost-conscious warehousing and production executives will find special interest in the account of savings gained through advanced handling methods in a certified job study prepared by *Towmotor Corp.*

USE RIP-OUT POSTCARD for more information on products introduced this month.

NEW MATERIALS & EQUIPMENT

25—Close fits with nylon-lined bearings

These standard Thinwall Nylined bearings, offered by *Thomson Industries, Inc.*, are being initially offered in ten sizes ranging from ¼ in. to 1¼ in. I. D. They consist of a thin, drawn steel outer sleeve and a free floating liner of DuPont FM 10001 Nylon. They are extremely compact, light weight, and resist poundout, decrease friction, permit dry operation, damp mechanical vibration, and minimize abrasion failures. They are corrosion resistant and can be operated submerged in liquids.



26—For quieter offices

One way to keep up office morale is by equipping your typewriters, calculating machines, etc. with an Andal Typad. This under-the-machine pad not only quiets the machine's performance, but it is easy to look at. Made from a combination of foam rubber on the bottom and a decorator-type fabric on top, furnished in two sizes—11 x 13 in. or 15 x 17 in., available from *Andrews-Alderfer Co.* in either green or gray fabric on harmonizing green latex base.

27—Desk-top two-way radio

As a component of its new line of 450-mc. two-way radio equipment designed for industrial use, *Motorola* offers this locally controlled base station housed in a desk-top cabinet. It incorporates a number of features, including the "Sensicon" receiver with its triple I. F. conversion and Permakay filter which guarantees permanent selectivity under all conditions of temperature, humidity, and vibration. This base station is the companion piece to previously offered mobile units.

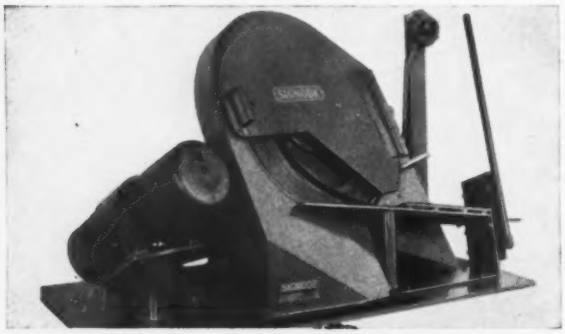
28

Air powered drill designed for ease of operation

"Gurmendi" air drill unit contains a hydraulic monitor which takes "sponginess" out of air, resulting in quick approach to work, positive adjustment rate through work, with no danger of break through, and rapid return. Drill has positive stop adjustments on both forward and return strokes. Stroke is a full two in. with controlled feed of 1½ in. Control of feeding rate is taken over at any desired point in spindle travel by monitor. Drill is compact, low in cost and has controlled air powered drilling unit for high speed production. Made by *Alkon Products Corp.*

29

Mill-type power strap dispenser



A dispenser for heavy volume users of steel strap handles ribbon wound strap in ¾-, 1¼- and 2-in. widths. It feeds strapping at rate of 6 to 10 fpm., and cutting operation requires only 2 to 4 seconds. It is made with extra-heavy steel frame, and it occupies a space 3 x 5 x 3 ft. and weighs 874 lb., empty. It is easy to operate, having push button control. Machine cannot start until safety door on coil holder is shut. Cutter blades are of high carbon, high chrome steel, and are reversible. A product of *Signode Steel Strapping Co.*

30

Conveyor centers automatically

Material traveling on this Alvey conveyor is automatically centered. Each roller is slightly tilted with alternate rollers tilted in opposite directions to form a "trough." Vee-Conveyor, produced by *Alvey Conveyor Manufacturing Co.*, comes in various widths and roller load capacities to suit varying requirements. Ideal for pipe, board, bars, shapes, shells and other similar items. They roll forward easily without necessity of a side guard.

31

Walls admit light, screen vision, last a lifetime

Corrugated and flat fiberglas reinforced translucent sheets called "Plexolite" have advantage of admitting light freely while screening vision. Shatterproof, weatherproof, economical, "Plexolite" is an ideal material for patio roofs, skylights, partitions, outer panel replacements and lifetime maintenance-free installations, according to *Plexolite Corp.*, manufacturer. Available in 12 colors, including coral, yellow, green and blue. Manufactured in four thicknesses; readily installed with ordinary tools.

32

Electric chain hoist has push button control

An electric chain hoist available in capacities from 250 to 2,000 lb. has push button control. Plug operates from any single phase lighting circuit, 220- or 440-volt power line. No more than 110 volts pass through control station, regardless of voltage used. Other features include: "Herc-Alloy" double duty flexible welded steel load chain, upper and lower safety limits; helical gears; positive chain guide; precision bearings; fully enclosed mechanism; permanent lubrication. Available from *Chisholm-Moore Hoist Corp.*

33

Narrow width hardboard panel for fast, easy installation

A first in construction materials is now offered to builders in *Forest Fiber Product Co.'s* Tee-N-Gee paneling. A light, natural wood color, tongue and groove hardboard panel, Tee-N-Gee measures 16 in. wide by 8 ft. long as compared to the 4 x 8 ft. panels which have heretofore been standard industry size. These panels permit fast and easy application over studs, furring strips or over old plaster walls by both unskilled and professional builders.

34

Wet-dry clean-up for floors

A new heavy-duty portable vacuum for wet and dry cleaning of floors is introduced by *United Floor Machine Co.* Called Uni-Vac, model UV1-901, this machine vacuums floors and rugs before scrubbing and then removes every trace of scrubbing solution to leave areas virtually moisture-free. Motor unit lifts out of its rubber cushion to be used as a separate portable blower. Providing both suction and blower action, Uni-vac can also be used for cleaning upholstery, removing dust and dirt from bins, shelves, pipes, beams, and machinery.

35

Crystals will prevent corrosion without coatings

Positive protection against rust without costly coating is chief feature of VPI, a volatile amine nitrite marketed by *Shell Oil Co.* This powder-like product also aids in reducing cost of packaging metal parts and protecting them during storage and shipment. Only small quantities of VPI are required for a job. It protects by giving off vapor which is carried to all metal surfaces and then condenses to provide a thin film. In addition to preventing rust, VPI arrests corrosion at any advanced stage.

36

New liquid stops corrosion

Protection of mild steel from corrosion after cleaning can now be achieved by application of a recently developed homogenous solution known as Kelite M-2 manufactured by *Kelite Products, Inc.* Product affords superior corrosion inhibiting properties, eliminates need for drying prior to treatment and is impervious to finger-printing. It may be applied by immersion, spray or brush. It is non-flammable (flash point 140 deg. F.), non-phenolic and non-toxic. It will not burn skin and vapors are safe to breath. It has a unique ability to displace and absorb up to 11% of its own volume in water without impairment of efficiency.

37

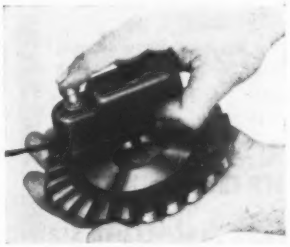
Roller chain requires little lubrication

A roller chain manufactured by *Whitney Chain Co.* has oil-impregnated sintered bushing that requires little or no lubrication. This chain was designed to satisfy a recognized need for a chain drive which would operate efficiently where conventional lubrication methods are either not possible or are not desirable. Laboratory tests indicate that this chain has a longer service life. It is especially suitable where lubrication damages material being processed.

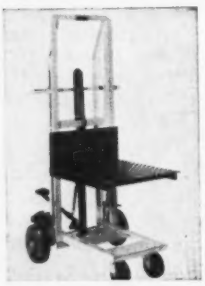
38

"Miti-Mite" for de-magnetization

Here is a foolproof device wherever magnetism is a problem, according to *Enco Manufacturing Co.* Called "Miti-Mite" de-magnetiser No. 500, this is a new portable instrument which thoroughly de-magnetizes tools, dies, parts and pieces by plugging it into any 110 A.C. outlet and sliding it over surface of item to be de-magnetized. Because of unit's plastic case and flush position of bottom, poles, sliding treatment will not mar or scratch highly polished surfaces. Its small ness is advantageous for use in cavities of die cast molds or for removing stray magnetism collected in punches or stamping dies.



39
Hydraulic lift for "rough spots"



"Big Joe" hydraulic lift has a 750-lb. capacity. Loads are raised or lowered by easy foot pedal pressure. Unit is equipped with heavy duty, dual ball bearing, 6-in. diameter swivel casters that take humps, holes or depressions in stride. This lift, manufactured by *Big Joe Manufacturing Co.*, has 10-in. solid rubber rear wheels and positive locking safety brakes.

40
Air manifold is ideal for variety of hand tools

Here is a ceiling suspension-type air manifold with added advantage of a moisture trap and drain. This four-way manifold is equipped with Foster quick detachable hose fittings and can be used with straight screw-in connections, if preferred. Entire unit weights only one pound —ideal in plants using a variety of pressurized hand tools. It is compact, easily handled and suited for quick change where a variety of tools are used at one bench. Low unit price makes it available to all types of manufacturing. Manufacturer is *Lynco, Inc.*

Use rip-out postcard for more information

41

Electrical indicating dynamometer

Here is *Dillon & Co., Inc.'s* latest addition to its line of traction dynamometers. Known as model "EL", these are its special features: 13 different capacities from 0-500 lb. up to 0-100,000 lb.; 5 or 10-in. diameter dial optional; dial is protected with shatterproof safety glass crystal; overload is protected; it is furnished with shackles and attachment pins; it is rust and moisture proof; compact (0-500-lb. model weights 8½ lb.); it is individually calibrated for maximum accuracy. This dynamometer works on principle of deflecting a calibrated beam. It is not affected by extreme temperature changes and is rugged enough to be treated as a field instrument.

42

Efficient thread roller introduced

Model 300 Prutton "Rollmaster" rolls class 3 fit threads in ½-in. - 13 hollow set screws at the rate of 19,440 pieces-per-hour. Machine performs on either hollow or solid work in a wide variety of metals ranging from non-ferrous, through aluminum and magnesium, to hardened and stainless steels. "Planetary die" principle reduces thread rolling pressure by distributing it evenly over a full 30 in. of die length, thus eliminating danger of distorting or crushing hollow parts. Pieces are hopper-fed and roll at close intervals around circumference of die. Large number of pieces in work at a time make possible slower die speeds, less wear and a proportionate extension of die life. Available from *D. H. Prutton Machinery Co.*

43

Diverter valve permits field installation

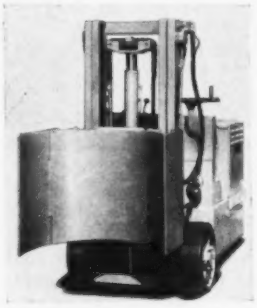
Newly designed diverter valve makes possible economical field installation of a number of special hydraulic attachments on fork trucks. With valve, truck's hydraulic system for tilting the upright can be used to operate special hydraulic attachment using standard tilt lever as means of control. When diverter valve plunger is in "up" position, oil flows to tilt cylinder, and truck operator has normal

control of tilting. Simultaneous operation of attachment and tilt cylinders is impossible. New valve is particularly advantageous when a hydraulic device would ordinarily be too costly or time-consuming or when old models need major modification making regular field installation impossible. Available from *Industrial Truck Division of Clark Equipment Co.*

44

Roll handling assembly added to fork truck line

A hydraulically-actuated roll handling assembly is added to *Mercury Manufacturing Co.'s* line of fork trucks. Entire clamp assembly is compactly constructed in "unit" fashion so that it can be installed in place of standard forks. Pressure connections to assembly are a quickly detachable self sealing type, and electrical connections are plug and socket type. Two bolts retain assembly on lifting carriage, and installation or removal and replacement can be effected in 20 minutes or less. Horizontally disposed rolls can be easily picked up without necessity of blocking and without employing special forward tilt range. Continuous clamping action is constantly maintained through use of a specially designed hydraulic system which includes a locking valve in the clamping cylinder and a pressure switch in the pump motor circuit.



45

Skid boxes stack to save space

These stacking boxes, made by *Industrial Skid & Pallet Co.*, are an answer to your storage space problem. Newly designed side rails permit skid legs to fit firmly on boxes' side rails. They are made of selected and seasoned hardwood, reinforced inside and outside with angle iron. End boards can be made removable for easy access to small parts. Industrial stacking boxes are built to your own order and specifications in any range of sizes and capacities.

46

Asbestos-like fiber is developed domestically

A new man-made fiber called "Fiberfrax" promising to solve many critical industrial and defense problems is being produced by *The Carborundum Co.* Combining aluminum oxide and sand, it resists temperatures that melt cast iron, yet it is fine enough to be used as a super-filter. It has low thermal conductivity, electrical properties, and flame-resistant characteristics. Fiberfrax is presently finding applications as high-temperature insulation in combustion and exhaust systems of jet engines. It is expected to find use in a host of industrial and defense applications as insulation, as replacement for or in combination with asbestos, as a filter, as a laminate in radomes and body armor, and as heat-resistant paper and board.

47

"Pocket tumblers" for pocket-sized items

A barrel having individual "pockets" is newly developed for tumbling from 2 to 6 items at a time. Model makers, jewelers, experimental laboratories and instrument manufacturers are typical of users who will be interested in this piece of equipment which is recommended by the manufacturer for deburring, precision finishing and polishing small metal and plastic parts. Removable pockets operating in a single frame attain a high degree of interchangeability with a single piece of equipment. It is suitable for all methods of tumbling by adding the recommended abrasive in any given pocket for process to be carried out. Units can be furnished with variable speed drives which further increase versatility. Available from *Tumb-L-Matic, Inc.*

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48

Aid to cutter grinding operations

Here is a new type relief grinding fixture that handles all types of cutter grinding operations. Grinder's main housing is made of finest grade cast iron which supports a hardened and ground spindle on two large bearing surfaces that require only periodic oiling. Cam is hardened tool steel with steel adjustment pins. Fixture swings 90 deg. to right or left. Base is calibrated in 5-deg. increments. This fixture operates with speed and accuracy and does not require a highly skilled operator. Available from *Industrial Grinding Co.*

49

20-in. disc sander and grinder

Max Manufacturing Co. adds a new 20-in. disc sander and grinder to its line of machines. This disc sander is good for such fine, accurate work as is done in a pattern shop. Used as a disc grinder for metal, new Max 20 eliminates many costly set-ups and machining operations. It will find wide application in tool and die shops, jobbing and production machine shops, sheet metal shops, aircraft plants and in foundries for use in grinding rough castings.

50

Hardboard and plywood joined for paneling

Building industry finds new material in Kalabord, product of *Columbia Plywood Co.* Board is made by gluing one piece of hardboard to one side of plywood, making, in one operation, a three-ply board. It is then run through a planer or grooving machine which striates hardboard side. Kalaboard is exceptionally hard and will not dent easily. It will not check or sliver, according to Columbia Plywood, and takes well to paint or can be left in its own natural color.

It is ideal for walls and ceilings, window and other display purposes.

51

Latest in core drills

Revolutionary new design for drilling cored castings, through-holes and counter boring is accomplished in *Tilden Tool Co.'s* latest core drill.

It is capable of cutting 80% from drilling time and 50% from drilling costs per foot, according to Tilden Co. This core drill has eight cutter holding precision size of the hole several hundred times as long as the three-and-four fluted standard high speed drills, according to the supplier. Its ease in drilling a through hole is another major feature of this instrument—core is removed by means of a patented core slot in drill body's side. These drills come in sizes ranging from ¾-in. to 4-in. diameter and up to 36-in. length. They can be had with a plain pilot for counterboring or a twist drill pilot for step drilling. Coolant feed attachment is available for use of the core drills on drill presses and lathes.

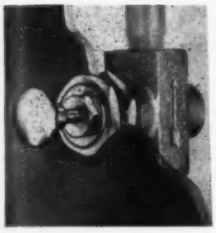
Correction

"Albi" fire-retardants, coatings which transform themselves into protective fire-barriers when exposed to intense heat and fire, are produced by *Albi Manufacturing Co., Inc.* and distributed by Admiralty Manufacturing Co. (latter firm was named manufacturer in item #765, July issue of *Western Industry*).

52

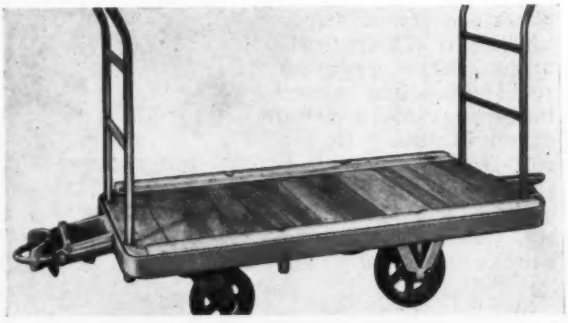
Non-leaking self-closing push valve

This self-closing push valve is ideal for use in gas and air lines where manual control of an intermittent flow is required and where there must be no leakage through valve or around valve stem. Valve is opened by pressing a knob on valve stem, and closed automatically when knob is released. It has no compression packing and requires no adjustment since it is sealed by neoprene O-rings. O-rings are accessible by removing nut and lifting out valve stem. Available in two styles: Model PV for mounting on panels of any thickness to 7/16 in., and Model LV for in-the-line mounting. Manufactured by *King Engineering Corp.*



53

Industrial trailer with "long-link" couplers



A new industrial trailer with redesigned couplers, high speed casters and a reduced price is available from *Lansing Co.* Trailer, which is built on a welded frame, has redesigned "long link" couplers for better maneuverability and increased convenience on overhanging loads. Decks and superstructures are custom-made to meet purchaser's requirements. Two styles of casters available; one for heavy service under normal conditions and the other for extra-heavy, high-speed service. High-strength iron, cast steel, molded-on rubber or phenolic resin wheels with either Hyatt-type or tapered roller bearings are optional.

54

So that lighters wont roam

For workers whose jobs are dangerous, rough or complicated, *Zippo* now makes a "Tach-A-Loop" lighter that stays where it is supposed to be. Gadget is wind-proof with a handy loop attachment on hinge of lighter cover. It can be fastened to watch chain or a leather or cord strap.

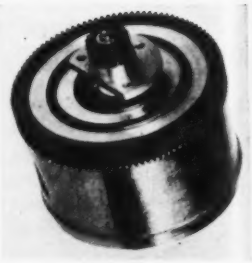
55

Step forward in caster design

Clark Duoflex Caster is a knee-action, shock-absorbing caster engineered for greater economy, efficiency and safety in a wide variety of handling applications. It may be used to replace present wheeled equipment as well as used with equipment designed for it. Its advantages result from combination of high deflection with low dynamics plus other features of construction. Rated standard capacities are available in small steps from 50 lb. or less, if required, to 1500 lb. or more if required, per caster in larger standard casters. Information and products are available from *All Steel Welded* ***Truck Co.***

56

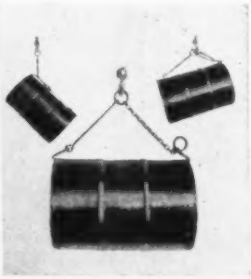
Magnetic clutch on market



Lear, Inc. makes available its Lear magnetic powder clutch for commercial and industrial equipment manufacturers' applications. This magnetic clutch has been application-tested for use on dyamotors, generators, marine drives, reversing drives, servomotors, and variable speed drives. While it is now produced in only three sizes (one, two, and two and one-half inches) company is prepared to design and produce for other applications.

57

Handy sling for barrels, drums and kegs



This sling, developed by *Palmer-Shile Co.*, is to be used for loading and unloading trucks and general purpose handling. It will also handle drums for draining purposes. It can pick up drum or barrel from lying position and set it on end. Handles drums, barrels, kegs. Is sturdily constructed of heavy welded chain and forged grab hooks. Has 1,000-lb. capacity and weighs approximately 8½ lb.

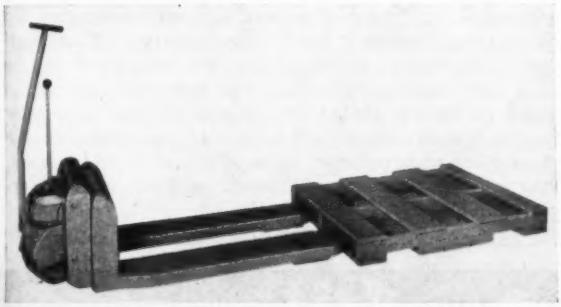
58

Something new in hardness testers

A pocket size metal tester weighing only 7 oz. is offered by *Peabody Industries, Inc.* Instrument is as accurate as standard equipment now in use which weighs hundreds of pounds, according to manufacturer. In addition, due to its size, new tester makes possible testing of internal mold and die sections with an area as small as one square inch. For calibration and use with parts weighing less than 15 lb., a clamping anvil providing sufficient mass to obtain full rebound is supplied. Anvil is unnecessary for work weighing over 15 lb. This low cost instrument also successfully tests nonmetallic materials such as fiberglas laminates, plastic sheet stock, wood and hard rubber.

59

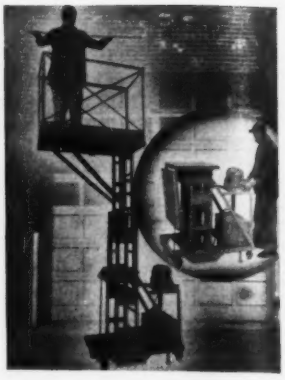
Floor truck designed for double face pallets



A new line of floor trucks is designed for double-faced pallets. These trucks have a forked design platform with toggle boosters and helper rolls that enable them to slip easily into double faced pallets without jockeying. Toggle boosters on ends of platform tines engage bottom face of pallet first, lifting platform slightly so that rear wheels can roll smoothly into pallet. Rear wheels are than projected through bottom of pallet and load is lifted by action of hydraulic pump. As platform is raised, it moves toward operator, facilitating use against walls. Capacity of truck is 4,000 lb. Available in five standard fork lengths from *Service Caster and Truck Corp.*

60

Portable platform speeds efficiency



This new "portable working platform—Hi-Lift-Midget," extends from a compact 46-in. high to 8½-ft. giving a working height of 15 ft. Base measures 27 x 40 in. Entire unit comes in one piece with no erection required. There are no loose parts. It is of sturdy all welded steel construction. Unit is ideal for all over-head maintenance, painting, lighting, cleaning and similar jobs. May be obtained through *Atlas Industrial Corp.*

61

The "new look" for production or inspection set-ups

A free consulting service through which production and inspection supervision can explore new concepts in optics for industry is offered by *Bausch & Lomb Optical Co.* in connection with its new industrial Stereomicroscope. By this service, Bausch & Lomb representatives will demonstrate how various models of the new instrument can be built into machine, assembly and inspection set-ups to speed processing, reduce rejects and diminish employee fatigue. Stereomicroscope permits continuous comfortable observation of an enlarged image with a wide field of view, long working distance, and three-dimensional, easily-interpreted qualities.

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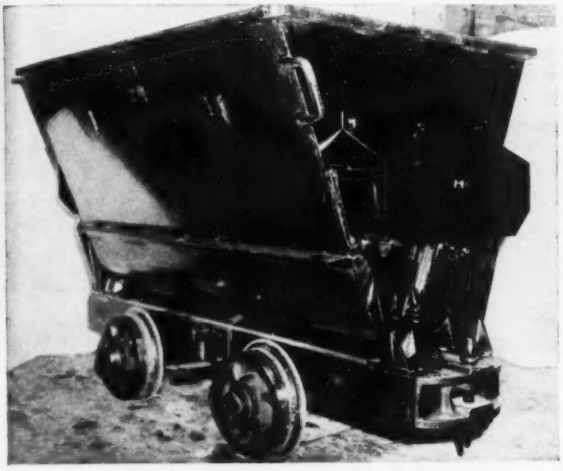
62

Dump truck features safety

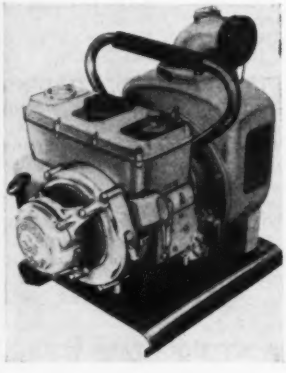


Coeur d'Alene Hardware & Foundry Co.'s improved rocker dump car dumps to either side and has an important safety feature serving as insurance that load cannot dump toward operator. Car is now provided with a keeper at either end making it impossible for car body to roll off truck. Car can be picked up from body for transfer from track to track in tunnels. Pat. pend. on improved features.

63

Portable pump for fire-fighting

A gasoline-powered pump, especially weight-engineered for portable duty in fire-fighting work is made available by *McCulloch Motors Corp.* New self-priming, centrifugal pump weighs only 57 lb. complete and has a capacity of 15,000 gph. It delivers water at pressures up to 100 lb. and is equally effective in delivering fog, spray, stream or foam. According to the manufacturer, 50% has been cut off weight of conventional 15,000 gph. pump through use of a special, light-weight engine utilizing high-pressure die-castings. Two-cycle type engine develops seven horsepower at 4,500 rpm. Pump is expected to fill an important role as a truck-pumper accessory as well as becoming a standby or emergency fire-fighting unit in isolated or inadequately protected locations.



64

Weigh it as you lift it

Here's a small hydraulic lift scale that fits right on any hydraulic cylinder-type fork truck. As it is lifted, weight of each load reads directly on dial. Installation is easy and scales fit into the lift truck's hydraulic system. Hydraulic pressure lifting load actuates scales thus eliminating chance of error from mechanical transmission. Available from *Martin-Decker Corp.*

THE WEST ON ITS WAY

ALASKA

ALCOA PLANS ALUMINUM SMELTING PROJECT — Aluminum Co. of America makes plans for a $400,000,000 aluminum smelting project in Taiya Valley district close to Skagway to be started as soon as necessary land and Government approvals are obtained. Project will require four years for completion and will mean employment for 4,000 when full scale operations are underway. It will be financed with private capital, and will include power facilities, smelting plant, and transportation facilities. Initial aluminum production will be 20,000 tons annually.

ARIZONA

MORE OF THAT GREEN STUFF—Salt River Valley's second vacuum packing plant for lettuce is planned for Glendale. Plant is a Vacuum Cooling Co. of California Project. It is first step in a large scale project, calling for similar plants to be built in Tolleson, Yuma and Mesa, and costing more than $1,000,000.

ST. LOUIS COMES WEST—Selb Manufacturing Co., St. Louis, Mo., will move its aircraft parts firm to Phoenix within a year, to a leased building at 2547 Jackson Street.

HOT AND COLD—Palmer Manufacturing Corp., heating and cooling firm, Phoenix, is purchased by McCray Refrigerator Co., Inc., Kendallville, Ind., for around $2,000,000. Transaction includes Palmer plant at 2200 W. Fillmore, all equipment, patents, and designs for Palmer heaters and evaporative coolers; however, Palmer will retain ownership of its Sno-Fluff Manufacturing Co. with operations in Phoenix, Flagstaff and Lubbock, Tex., and Palmer Radiator Manufacturing Co. plant at Seventh and Jefferson. No change in policy or personnel is anticipated by McCray.

SOUTHWEST PLANS EXPANSION—Expansion of Southwest Lumber Mills operations in this state are being planned pending a stock sale to Edens-Birch Lumber Co. of Corrigan, Tex. Funds will be used, in part, for installation of new dry kilns in Flagstaff and for lumber handling and storage facilities at McNary.

CALIFORNIA

VAN NUYS GETS CONTENTED—New $500,000 research laboratory center for Carnation Co. is being constructed at Van Nuys. The building will consist of six laboratories, a pilot plant for experimental processing of dairy and cereal foods, offices and a basement.

At the end of World War II, this was a deserted Air Force base at Chico, Calif. Today it has 19 industrial tenants, and is a rapidly-expanding asset to Northern California.

Almond By-Products Co., Chico, leases from City of Chico a 10,400 sq. ft. building plus about one-half acre of concrete apron at the Chico Municipal Airport Industrial area. Operations formerly carried on at the in-town Chico location will be moved and considerably expanded at the airport, with addition of more employees and equipment. Peak production will use 30 employees. Business is the processing of almond hulls into cattle feed.

Victor Industries Corp., manufacturer of pharmaceutical tubes (toothpaste, shaving cream, etc.) leases a 20,000 sq. ft. building in the industrial area of Chico Municipal Airport area. This is in addition to the three buildings in the Airport Industrial area now occupied by Victor. Latest acquisition will be used as a machine shop for Victor's own business, plus outside machine work when scheduling allows. Jack Porterfield is general manager.

NEW PLANT FOR BECKMAN — A 200,000 sq. ft. expandable design plant for Beckman Instruments, Inc. of South Pasadena, will be built on a recently acquired 45 acre site in the La Habra-Fullerton area.

REDWOOD MILL SOLD — Tom Dimmick, James Hoonan and Sam Anderson purchase Redwood Hiway Lumber Co., three miles north of Piercy, will commence operations very soon.

DAYTON BUYS LATEX FIRM — All outstanding stock of American Latex Products Corp., Los Angeles, will be acquired by The Dayton Rubber Co., subject to satisfactory completion of audits now in progress.

LONGREN BUILDS—Longren Aircraft Co., Torrance, doubles facilities by building a complete new factory alongside its present one.

ZERO ADDS—New addition to Zero Manufacturing Co. at 1121 Chestnut St., Burbank, will connect main plant with warehouse facilities. Increased space will mean additional shearing facilities demanded by company's increased orders for electronic and metal parts, specialized aluminum cases, deep drawn boxes and thread racks.

WEST GETS AUTOMATIC LOADING PLANT FOR AEROSOL — A custom loading plant, Par Industries, Inc., equipped to handle over 8,000,000 cans of aerosol per year, is established at 2193 E. 14th St., Los Angeles.

STOCKTON GETS SALTY—U. S. Navy awards contract for construction of eight 60-ton floating cranes to Guntert & Zimmerman Construction Div., Inc., Stockton. Cost is estimated at $3,960,000.

SYLVANIA AT MOUNTAIN VIEW—San Jose County Planning Commission issues permit to Sylvania Electric Products, Inc. to build $450,000 industrial plant and research laboratory near Mountain View.

NEW HOUSE FOR MOREHOUSE — Morehouse Industries, Los Angeles manufacturer of high speed stone mills for food and chemical processing, commence a new building adjacent to present headquarters plant.

NEW SHOES—Ted Saval Shoe Manufacturing Co., Los Angeles, is acquired by General Shoe Corp. New division, known as Ted Saval, Inc., produces 500 to 600 pairs of shoes a day in a 17,000 sq. ft. factory.

SUNNYVALE IS SITE—Illumitronic Engineering Co., manufacturer and developer of electro-mechanical devices and processes builds a new plant at 680 E. Taylor St., Sunnyvale, Calif.

TYSON CHROME DEVELOPING—Development work at Tyson chrome mine in French Hill area is progressing.

ANOTHER MILL FOR HUMBOLDT—Soon to be in operation near Humboldt Bay, will be a planing mill and dry kiln, owned by Los Angeles financial interest. A production of 200,000 board ft. of lumber a week is anticipated.

AMMONIA FIRM FORMS—Ammonia Chemical Corp. of Calif. is a newly-incorporated firm, with intention to construct a plant on a 25-acre site now under option at Oleander (near Fresno), and produce 100 tons of synthetic anhydrous ammonia per day. Plant construction is expected to start late this year: completion and first production of ammonia is scheduled for early 1954.

PULLMAN FURNITURE — Pullman Couch Co. of Calif., Inc., wholly-owned subsidiary of the Pullman Couch Co. of Illinois, leases 100,000 sq. ft. of office and factory space at 6351 S. Regent St. in Huntington Park to manufacture the complete Pullman line of living room upholstered furniture and dual-purpose sleepers. Los Angeles plant, third in the Pullman Couch chain, will serve furniture dealers in the Western states. This marks the first time the Pullman line will be manufactured on the West Coast.

BALL MILL AIDS MINING—Sarita Milling Co., after adding a ball mill to its reduction plant, is now working at capacity at its Masonic district gold mine. Company operates Chemung and Sarita properties in Masonic area. Approximately 100,000 tons of milling grade ore are thought to be contained at Sarita operations. Ore is mined by power shovel in an open pit.

HOLMES-DOUGLAS MILL BURNS—A flash fire August 21 destroys the Holmes-Douglas mill directly east of Humboldt Plywood mill on Arcata-Blue Lake road. Mill was valued at $85,000.

CHEMICAL FIRM CONSOLIDATES—Hawxhurst & Co., Inc., raw chemical brokerage firm, consolidates all of its Bay Area activities in a $200,000 plant at Second and Gilman streets, Berkeley. Company formerly had its head offices in San Francisco utilizing warehouses throughout the area. Berkeley plant, formerly occupied by the General Petroleum Co., is completely rehabilitated. It covers 45,000 sq. ft. and has extensive special equipment to serve paint, varnish, petroleum, rubber, soap and disinfectant industries, and the exporting field.

PLYWOOD CO. PURCHASED AT CALPELLA—Durable Plywood Co., Arcata, purchases Coast Plywood Manufacturing Co., Calpella, Calif. No changes in plant or product are planned. Elmer Hall is local manager.

MACHINE CO. SELLS AT ALHAMBRA—Milford Rivet & Machine Co. of Milford, Conn., purchases Pacific Rivet & Machine Co., Alhambra. Present personnel and management of West Coast firm will not be changed, and it will be called Milford Rivet & Machine Co., Pacific Division.

PAPER PLANT PLANNED FOR TRACY—American Reinforced Paper Co. commissions San Francisco architect William Corlett to design a $500,000 manufacturing plant to be constructed in Tracy. Plant will produce a waterproof, reinforced paper used in construction, industry and agriculture.

OIL FIRM LEASES ACREAGE—Shell Oil Co. signs 20-year lease for oil and gas exploration on 922 acres of land in southeast Sutter County from Sacramento and San Joaquin Drainage District.

4th FACTORY FOR PASTUSHIN AVIATION—To provide additional facilities for production of jettisonable fuel tanks being manufactured for U. S. Air Force, Pastushin Aviation Corp., Los Angeles, acquires a new factory building at 5300 W. Century Blvd.

PG&E TUNNEL CONTRACT AWARDED—Contract is awarded to Walsh Construction Co. for construction of a multi-million dollar tunnel to divert water from Pit river to PG&E's proposed Pit 4 Powerhouse. It will be four miles long, 19 ft. in diameter and concrete-lined.

STANDARD OIL PLANS CRACKING UNIT—Standard Oil Co. of California plans to build a new catalytic cracking unit at its El Segundo refinery, to cost over $20,000,000. Facility will have 36,000 barrel daily capacity.

NEW PIPE LINE—Petroleum Administration for Defense grants approval for West Coast Pipe Line Co., Dallas, to construct a 24-in. crude oil pipeline, 953 miles long, between Wink, Tex., and Norwalk, Calif., with a daily capacity of 100,000 barrels. Line will permit deliveries to a proposed oil refinery at Florence, Ariz. and to El Paso Tex. refineries, as well as those in California.

GRAIN STOCKING ELEVATOR FOR STOCKTON—Miller Malting Co. of Los Angeles will build a $2,000,000 grain elevator on a 30 acre site east of Port of Stockton. First unit will have a one million bushel capacity with a potential later construction up to three million bushels.

DIAMOND MATCHES PLANS AT RED BLUFF—Diamond Match Co. receives a certificate of necessity from National Production Authority for rapid tax amortization of a $3,509,385 defense-connected lumber project at Manton, near Red Bluff.

NPA MAKES ALLOTMENTS—National Production Authority makes supplemental allotments of materials to following California firms: General Motors auto assembly plant at South Gate, $2,272,167 worth of materials; Hughes Aircraft Co., Culver City, four projects for aircraft and guided missiles, estimated costs aggregating $1,022,000; Rohr Aircraft Corp., Chula Vista, $177,000 for aircraft production.

METAL STAMPINGS FIRM BOUGHT BY McCULLOCH MOTORS — McCulloch Motors Corp., Los Angeles, purchases Exacto Manufacturing Co., 827 W. Olive St., Inglewood, principal makers of metal stamping for McCulloch's chain saw.

HYCON CONTRACTS—Hycon Manufacturing Co., Pasadena, receives from U. S. Government $10,000,000 contracts and letter of intent for aerial photographic reconnaissance equipment, guided missile, electronic equipment and rockets.

CARBIDE AND CARBON CHEMICALS CO. EXPANDS — New $36,000,000 polyethylene and ethylene glycol plant of Carbide and Carbon Chemicals Co. will be located in Torrance on a 140-acre piece of land purchased from General Petroleum Corp. Site is immediately adjacent to General Petroleum's Torrance refinery which will, by a 20-year contract, supply Carbide and Carbon Chemicals Co. with raw materials. Plant is being designed to produce from 50 to 60 million lbs. of polyethylene and from 5 to 10 million gallons of ethylene glycol yearly.

AIR FORCE CONTRACT FOR PACIFIC AIRMOTIVE — Approximately 100 C-54's will be reconditioned at Pacific Airmotive Corp.'s Chino, Calif. base under terms of a new Air Force Letter Contract awarded to PAC. Contract's approximate dollar value amounts to $2,800,000.

SOLAR SHIPS POWER PLANT—Solar Aircraft Co., San Diego, ships its first gas turbine-driven auxiliary power plant

to Wright Field, Ohio. It incorporates 60 lb. Mars turbine engine which produces over 45 horsepower.

NEW HOME OF AIRESEARCH ENGINEERING—Engineering department of AiResearch Manufacturing Co. moves to enlarged quarters in a new building at 9225 Aviation Boulevard, Los Angeles.

CONNOR SPRING MANUFACTURING CO. PLANT—San Francisco plant and general offices of Connor Spring Manufacturing Co. move to new building at 75 Fourteenth St.

U. S. STEEL CONTRACT TO RESTORE PLANT AT PITTSBURG—Contract between Columbia-Geneva Steel division of United States Steel and U. S. Government provides for restoration and rearrangement of Government's defense plant foundry located at Pittsburg. Plant equipment worth approximately $9,500,000 will be installed to provide for production of armor steel hull castings for U. S. Army's tank program.

MARCHANT ENTERS ELECTRONICS FIELD—Marchant Calculators, Inc., actively enters electronics field by acquisition of a controlling interest in Physical Research Laboratories, Inc. of Pasadena, developer and maker of electronic computers and components. Laboratories are renamed Marchant Research, Inc. and all activities are now in Oakland.

DAVIS ELECTRONICS MOVES—Davis Electronics, manufacturer of television antenna, moves from former location at 3047 W. Olympic Blvd., Los Angeles, to new quarters at 4313 W. Magnolia Blvd., Burbank.

QUICKSILVER MINE GETS LOAN—Defense Minerals Exploration Administration agrees to advance three quarters cost of an exploration project at New Idria Mining & Chemical Co.'s New Idria quicksilver mine in San Benito County.

ESTON SELLS TO AMERICAN POTASH—American Potash & Chemical Corp., acquires Eston Chemicals, Inc., Los Angeles, maker of agricultural chemicals, refrigerants, aerosols and industrial chemicals. Eston Chemicals will be operated as Eston Chemicals division of American Potash.

PELLETIZED FERTILIZER PROCESS SOUGHT AND BOUGHT — Stauffer Chemical Co. acquires American rights from Rumianca, Societa per Aziona, Turin, Italy, to a method of making fertilizer in pelletized form. Other producers may obtain and use process under sub-licensing agreements.

BEER NEAR FOR LOS ANGELES—Joseph Schlitz Brewing Co. of Milwaukee, Wis., plans to build a $20,000,000 brewery in vicinity of Van Nuys, San Fernando Valley. Construction of a one-million-barrel-annual-capacity plant will be started before year's end.

HELLER CO. PLANS L. A. PLANT—Heller Co., maker of Industrial staplers, will build a 100,000 sq. ft. plant in area of Los Angeles as soon as a site can be located.

SIGNAL DEPOT WORKER DEVELOPS MONEY SAVER CLUE—John F. Smpardos of Sacramento Signal Depot develops a new cement which may save government spending by millions of dollars annually. New cement successfully reseals bakelite base of radio tube to glass envelope when the two sections are separated.

GERHARDT CO. STARTS UP AGAIN—George T. Gerhardt Co., Inc., metals fabricator, sells its San Francisco plant and will resume operation Oct. 15 in Sausalito.

FURNITURE CO. CHANGES NAME—Firm formerly known as General Wood Products changes name to C & S Furniture Co. New housing for company activities is being completed at 385 Preda St., San Leandro.

SHAMBAN CO. SHIFTS PLANT—W. S. Shamban & Co. moves plant from Vernon, Calif. to Culver City. Production facilities are tripled and number of employees doubled. Manufacture of molded and fabricated fluoroplastic parts is already started.

FILTROL WILL BREAK GROUND FOR PLANT—Filtrol Corp. plans to start construction of a $5,000,000 plant about 1½ blocks from company's present Vernon facility in late Oct. Plant will manufacture alumina and ammonium sulfate using a by-product, acidic liquor, from present Vernon operations.

DURABLE PLYWOOD BUYS UKIAH MILL—Stockholders of Durable Plywood Co. purchase Coast Plywood mill at Calpella, five miles north of Ukiah.

RICHFIELD TO EXPAND LONG BEACH OPERATIONS—Richfield Oil Corp. plans an estimated $39,489,000 expansion project at its Watson refinery near Long Beach. Work is to include a new fluid catalytic cracking unit with a capacity larger than any similar unit on West Coast.

CARRIER WILL PULL INTO S. F.—Carrier Bon Homme Richard, Essex class, will be brought into Hunters Point in January for a conversion job estimated at $62,000,000 and two years' time for completion.

FORD ASSEMBLY AT RICHMOND TO DOUBLE—Ford Motor Co. is going ahead with plans to double its Richmond assembly plant's capacity. Project should be completed within a year. Production capacity will jump from 225 to 500 cars finished daily.

RYAN FIELD LEASED FOR INDUSTRY—American Pipe & Steel Co. of Alhambra leases county-owned Ryan Airport property outside Hemet city limits as site for a branch plant to produce military aircraft fuel tanks and a new type mine casing for naval use under two defense contracts.

SAN FERNANDO VALLEY TO GET BREWERY—Anheuser-Busch, Inc., plans construction of a $45,000,000 brewery at Van Nuys in an area bounded by Roscoe Blvd., Woodley and Haskell Avenues, and Southern Pacific tracks.

HOFFMAN LABS EXPAND—Hoffman Laboratories, Inc., division of Hoffman Radio Corp., 3761 S. Hill St., Los Angeles, is adding to its facilities so that more electronic equipment may be manufactured.

JOHNS-MANVILLE CORP. TO INCREASE PRODUCTION—Johns-Manville Corp. will expand manufacture of insulation products in new plant facilities at 223rd and Alameda Avenue, Wilmington.

HYDRAULIC UNITS—Langley Corp. of San Diego will construct, this fall, a new 45,000 sq. ft. $300,000 plant on corner of Euclid and Market Streets where hydraulic units for Boeing and Lockheed will be manufactured.

NEW TYPE BOATS—Narmco Manufacturing Co., San Diego, is entering field of boat manufacturing with plans to produce a fiberglas craft.

MILL INSTALLS OPEN-HEARTH FURNACE—Pacific State Steel Corp. mill at Niles puts into production a third open-hearth furnace to boost steel-making capacity by 70,000 tons a year.

RHEEM MOVES EQUIPMENT—Rheem Manufacturing Co. moves its furnace-making equipment from former plant in Stockton to two new buildings providing 30,000 sq. ft. of space for firm in Newark.

NEW SAWMILL AT CRESCENT CITY—A new mill, built by Castle Sawmills, Inc., at Crescent City, will produce 200,000 ft. of lumber per shift.

FOSTER & KLEISER TO CHANGE HANDS—W. R. Grace & Co., international business concern, is working on acquiring ownership of Foster & Kleiser Co., Western outdoor advertising firm.

PG&E FIRE—A concentration of cleaning solvent vapors is blamed for a fire razing Pacific Gas & Electric Co. truck storage garage in San Jose and causing an estimated $300,000 worth of damage.

CALPACK GOES FOR SARDINES—Calpack, San Francisco packing firm, purchases former San Carlos Canning Co. property at Oxnard.

MILL CONSTRUCTION PLANNED—Lucas Brothers of Sutherlin, Ore. plan construction of a 40 x 168 ft. steel and concrete mill and a million ft. log pond three miles south of Piercy, Calif.

RACING CARS COME TO SAN LEANDRO—Jack C. Hagemann purchases a lot 140 ft. x 37½ ft. in Lebrun Tract on Timothy St., San Leandro, as site for a 30 ft. x 55 ft. building to house facilities for manufacture of custom built foreign and racing car bodies. In addition, aircraft metal work will be produced.

EASTSIDE DISTRIBUTORS BUILD—J. M. Ferreira of Eastside Distributors, 720 Williams St., San Leandro, will build additional warehouse space at rear of existing building recently leased to Roddiscraft.

LEMON CO. PROVES NO LEMON—A $2,000,000 expansion for Exchange Lemon Products Co. plant at Corona will double capacity and necessitate employment of 50% more workers.

HOSPITAL CONSTRUCTS—Fairmont Hospital is building an $800,000 powerhouse and shop building at 15400 Foothill Blvd., San Leandro.

BRODIE CO. RE-LOCATES—Ralph E. Brodie Co., Inc., manufacturer of gas and oil meters, moves into new plant and offices at Alvarado and W. 137th Ave., San Leandro. Firm was formerly located in Oakland.

BM&T EXPANDS — Blake, Moffitt & Towne, Pacific Coast paper distributor, purchases Corcoran Paper Co. of Long Beach and Santa Ana. Direction over expanded operations is assumed by Long Beach manager, Millard J. Hines.

NAVAL "LAB" EXPANSION — This fiscal year, a sum of $98,000 will be used in an expansion program for San Diego's Navy Electronics Laboratory which will increase production and research and give additional protection to equipment worth millions of dollars.

COLORADO

MORE MOLYBDENUM — Climax Molybdenum Co. plans to mine 17,000,000 tons of low grade molybdenum ore in Lake County following approval for federal support of the project. Firm agrees to spend $9,500,000 in molybdenum mining operations which are so difficult to operate that mines would be abandoned without government support.

WORK RESUMED ON SEAMLESS PIPE MILL—Colorado Fuel & Iron Corp. resumes work (suspended during steel strike) on its seamless pipe mill under construction at Pueblo.

SUB-ZERO WAREHOUSE FOR DENVER—Beatrice Foods Co. plans immediate construction of a sub-zero single storage refrigerated warehouse in Denver. D. H. Murphy is manager of Beatrice's Denver warehousing operations.

NEW NEWS AT HYMAN PLANT—Shell Chemical Corp., now owner of Julius Hyman & Co., will centralize all of its agricultural chemical activity in Denver. New organization is to be known as Julius Hyman & Co. division of Shell Chemical Corp., and will market insecticides, aldrin, dieldrin, soil fumigants and spray oils.

NEWSPRINT NEWS—Columbine Pulp and Paper, Inc. is formed by Colorado publishers to build a newsprint mill between Grand Junction and Glenwood Springs.

IDAHO

AEC AIRCRAFT TESTING PROJECT IN VIEW—Construction of facilities for eventual development of atomic powered aircraft at National Reactor Testing Station in Idaho is authorized by U. S. Atomic Energy Commission. Project will cost an estimated $33,000,000.

SMELTER SHUT-DOWN — Bradley Mining Co.'s smelter at Stibnite, Idaho, shuts down except for a 20-man maintenance crew. Closure is due to price reduction of this metal from 50 to 25 cents per lb.

SULPHURIC PLANT STARTED—Sullivan Mining Co. of Kellogg, commences work on its 250-ton-per-day sulphuric acid plant in Coeur d'Alene district. Already, firm anticipates expansion of original plans.

MONTANA

FLOUR MILL EXPANSION PROPOSED — Montana Flour Mills Co., Great Falls, plans a $100,000 expansion and improvement program at Ceretana Feed plant, Bozeman. Plant will remain in operation during 10 to 12 months involved in the extensive modernization project.

INDUSTRIAL AREA OPENS—Work on Glendive's industrial section, lying east of city, is being finished complete with two newly laid spur tracks. Shortly, firms supplying oil business needs will start operations here: W. H. Connors Co., oil well supply; Maloney-Crawford, Tank and Maintenance Co.; Jones & Laughlin Supply Co.; Halliburton Oil Well Cementing Co.; Dowell, Inc.; B. J. Service Gas and Tank Oil Specialty Co.; Volne & Waitte Company; and Guelff Company.

NEVADA

HASTA BE SHASTA—Colorado River Commission contracts with Bureau of Reclamation for up to 90,000 kilowatts of Shasta Dam power for Nevada to be absorbed during next two years.

POWER PLANT SUSPENDED—Construction of half-completed $3,000,000 Hercules Powder Co. plant at Henderson is indefinitely suspended.

NEW MEXICO

MAKING TRACKS—Santa Fe Railway plans a $1,500,000 expansion of its Belen yards. Work will commence upon approval by NPA. Capacity of yards will be increased by 20%.

REA BUYS POWER PLANT SITE—Rural Electrification Administration purchases 47 acres six miles north of Algodones for a multi-million dollar power plant.

HELIUM PLANT IS REACTIVATED—Navajo helium plant at Shiprock is being reactivated by U. S. Bureau of Mines for continuous day and night operation. Plant will provide employment for about 75 civil service workers when in full operation.

SULPHUR PLANT FOR FARMINGTON—Plans are completed for building a $500,000 plant to produce block sulphur from waste gas at El Paso Natural Gas Co.'s San Juan processing plant. Plant, to produce 70 tons of sulphur daily, will be third largest in United States for recovery of sulphur from natural gas. A pilot plant has already been installed.

NEW BUSINESS—Morris Steel and Supply Co. opens for business at 701 Coal Ave. S. E. in Albuquerque. Firm, headed by LeRoy Morris, specializes in steel and all kinds of metals, oil well supplies, pipe, etc.

OREGON

TIMBER FOR TOLEDO—A limited plywood plant for Toledo is planned by Georgia-Pacific Plywood Co. New operation will be located next to C. D. Johnson Lumber Corp., which Georgia-Pacific purchased last year.

SMELTER ENCOURAGED — Springfield city council agrees to spend $10,000 for a subsidy to encourage Apex Smelting Co., Chicago, to establish an aluminum reduction smelter there.

PIPED TO BEDFORD — Newly organized California-Oregon Pipeline Co. is granted a permit to lay a 103-mile oil pipeline from Crescent City, Calif. to Medford. Cost of this six-in. carrier will be about $2,500,000 and will have a daily capacity of 7,000 barrels with one pumping station. Permit calls for a fast tax write-off plan.

BIGGER PLANS FOR IRON FIREMAN—Iron Fireman Manufacturing Co. plans on a 75% enlargement of its Portland heating control division.

DIAMOND LUMBER BUYS MILL—Ford & Ford Lumber Co., Portland remanufacturing firm, is purchased by Diamond Lumber Co. Diamond will buy lumber outside of Portland and finish it at new mill.

C & L LUMBER BUILDS MILL—Prineville Machine & Supply Co. is building a new sawmill on U. S. highway 26 between John Day and Prairie City for C & L Lumber Co. With a minimum amount of labor, mill will be able to turn out between 50,000 and 60,000 board ft. of pine lumber per day.

WAREHOUSE FOR GATES — Gates Rubber Co. commences building a warehouse and office building at N. W. 30th Ave., Portland.

FIBER PLANT—Construction is under way on a $5,000,000 wood fiber plant at Pilot Rock to be known as Oregon Fibre Products, Inc. It will reclaim waste from Pilot Rock Lumber Co. and Kern Co. of Oregon, Ltd., in production of soft and hard-board products. Plant's potential manufacturing capacity is 90,000,000 sq. ft. per year or 300,000 sq. ft. daily.

GAS TURBINE EXPERIMENT — Oregon Forest Products Laboratory will install an experimental sawdust-fed gas turbine worth $100,000 in a sawmill near Corvallis within ten months. Generally wasted sawdust will be used as power source. Heat exhausted by turbine will be employed in drying lumber in kilns.

AMC PLANT STARTS UP—American Metallic Chemicals Co. starts production of electrolytic manganese dioxide at its new Portland installation. Plant processes imported ores exclusively and produces a battery grade oxide. Company hopes to double its production from 10,000 lb. to 20,000 lb. daily. Firm has further plans to branch out into production of sodium perborate, a bleaching agent used in soaps and detergents, and becoming one of two manufacturers of this chemical in the country. Raw materials would come from California and Portland vicinity. If plans are carried out, production of sodium perborate will begin in August, 1953.

PEELER MILL—A plywood peeler mill at Glendale, Ore., is being built by Multnomah Plywood Co. of Portland. When completed, mill, a single lathe operation equipped with Coe machinery, will employ 40 men. It will process lumber from Multnomah Plywood's timber-lands and from The Robert Dollar Lumber Co. mill at Glendale.

UTAH

SAN PLAN—The San Equip, Inc., Syracuse, N. Y., manufacturer of sanitary equipment, buys a site on South Second West St., Salt Lake City, and plans to erect a plant there.

NEW PLANT FOR GARFIELD—American Smelting and Refining Co.; Garfield Chemical and Manufacturing Co., affiliate of Kennecott Copper Corp.; and Stauffer Chemical Co. will build a

$5,000,000 phosphate fertilizer plant at Garfield. New plant will produce more than 60,000 tons of concentrated phosphate fertilizers a year, and phosphoric acid used in making superphosphates will be produced by "wet" or "leach" acid process. New operation will be located on a 600 acre site near AS and R smelter. Approximately 75 men will be employed. This plant should not be confused with one proposed for Garfield by Missouri Farmers Assn. which has been cancelled.

WASATCH CHEMICAL EXPANDS—Wasatch Chemical Co. starts a $100,000 expansion program in order to handle an additional 10,000 tons of ammonium sulphate annually from Howe Sound Co., Garfield, and from Columbia Geneva Steel division, U. S. Steel Corp. Firm is presently building an 8,000 sq. ft. mixing and batch house.

CARBON DIOXIDE PROJECT — Carbon Dioxide and Chemical Co., affiliate of Fulton Petroleum Corp., is presently engaged in a CO-2 expansion program. A $65,000 warehouse and offices will be constructed at 648 S. 1st West, Salt Lake City.

PIPE LINE LAID—Salt Lake Pipe Line Co., a subsidiary of Standard Oil Co. of California, awards contracts for construction of its eight million dollar, 330-mile oil products pipe line running from Salt Lake City to Boise, Idaho. First portion of eight-inch line, from Salt Lake City to Juniper, Idaho, will be built by Macco Corp. of Southern California. Engineers Ltd. Pipe Line Co. of San Francisco will build remaining 200 miles to Boise.

FURNACE OILS INCREASED — Salt Lake Refining Co., a Standard Oil Co. of Calif. subsidiary, makes a $350,000 investment to increase production of furnace oils. Gas-oil conversion facility will produce high grade furnace oil at rate of 2,000 bbls. daily. Product will be sent to Northwest via Salt Lake Pipe Line's petroleum products transmission facility.

ORE-SAMPLING PLANT TO COME—Atomic Energy Commission will establish an ore-sampling and buying facility near Greenriver to stimulate production of uranium ores in southeastern part of state. New plant will have 200-ton ore sampling capacity per day.

WASHINGTON

STANDARD GOES SNOHOMISH — Standard Oil Co. of Calif. buys 2,000 acres of land in Snohomish County for possible future use as a refinery site. Purchase price is $900,000.

SKAGIT STEEL GETS NAVY CONTRACT—Skagit Steel & Iron Works, Sedro-Woolley, is awarded $1,250,000 in navy contracts to supply hoisting winches to Bureau of Yards and Docks, Port Hueneme, Calif.

CAR CONTRACT AWARDED — Bangor & Aroostook Railroad awards a contract for 250 refrigerator cars and 250 insulated cars, equipped with heaters, to Pacific Car & Foundry Co., Seattle.

PIPELINE PLANS FOR NORTHWEST —Pacific Northwest Pipeline Corp. files application with Federal Power Commission for building a $120,000,000 natural gas pipeline from New Mexico-Colorado region to Pacific Northwest. Plus pipeline cost, over-all project requires $15,000,000 for a gathering system and $40,000,000 for a well drilling program. Major source of natural gas supply will come from San Juan basin field in Four Corners area (New Mexico, Arizona, Utah, and Colorado).

BUILDINGS FOR BOEING—Boeing Airplane Co., Seattle, will start construction of two large buildings for company use in maintenance, transportation, and material preparation. Air Force will finance both construction and site of buildings. They will lie north of firm's Plant No. 2 in Seattle.

CONCENTRATING PLANT AT TONASKET NEARS COMPLETION—Within three months, a 500-ton concentrating plant will commence operations on gold, silver, lead and zinc ore at Silver Mountain Mining Co. property west of Tonasket. Mill will have an initial 250-ton daily capacity eventually to be built up to 500 tons.

VANILLIN PLANTS LINKED — Monsanto Chemical Co.'s new plant at Seattle and its St. Louis plant are now linked in production of vanillin. Semi-refined vanillin, made in Seattle is shipped to eastern plant for refining to U.S.P. product.

CRANE CO. TO CONSTRUCT—Crane Co. hopes to start construction this fall of a $175,000 combination warehouse and office building and a pipe warehouse in Spokane.

UTAH COMES TO QUINCY—Amalgamated Sugar Co. of Ogden, Utah, buys a beet sugar factory site five miles south of Quincy in center of Columbia Basin irrigation project. Firm plans on building a plant there when area's agricultural development has progressed sufficiently to justify a new factory.

CONSTRUCTION OF SUGAR REFINERY GOING FULL TILT—Utah & Idaho Sugar Co. is now building a $7,000,000 refinery three miles east of Moses Lake.

AEC PLANS FURTHER ENLARGEMENT AT HANFORD—U. S. Atomic Energy Commission completes agreement with Kaiser Engineers, Oakland, Calif. for construction of a large part of new expansion planned for Hanford plutonium-producing project.

FELTROK SELLS OUT — American Rock Wool Co., home office Wabash, Ind., buys Feltrok Insulation & Manufacturing Co., 2301 Taylor Way, Tacoma. Installation of new equipment will change manufacturing process from blowing to spinning.

WYOMING

COKING COAL PLANT IN OFFING—A $126,000,000 coking coal plant is proposed for Kemmerer to provide coking coal for Yolo Steel & Metal Co. of Sacramento, Calif. Contracts have been signed with Kemmerer Coal Co. for this purpose.

WESTERNERS AT WORK

Arizona

Arizona Public Service Co., formed by merger of *Central Arizona Light and Power Co.* and *Arizona Edison Co.*, makes the following appointments: GEORGE H. GROH, vice president in charge of operating and engineering; J. L. LIECTY, treasurer and assistant secretary; F. T. FAHLEN, JR., vice president and manager of Valley Division; W. P. REILLY, vice president and manager of State Division; WILLIAM ISMAY, personnel manager; R. T. RICHARDS, general superintendent; and E. M. JORGENSEN, superintendent, System Gas; DON WILLIS, general sales manager.

California

GEORGE BOYLE, formerly head of a manufacturing concern in Los Angeles, joins *Narmco Manufacturing Co.*, San Diego, to take charge of the polyester division.

JOHN H. TYSON, becomes president, *San Francisco Lumber Co.*, succeeding JAMES TYSON, JR., deceased. Other new officers include REX CLARK, executive vice president and MRS. JAMES TYSON, JR., vice president.

WILLIAM L. KEADY, former president of *U. S. Gypsum Co.* and the *Marathon Paper Co.*, is elected president of *Pabco Products, Inc.*

CHARLES P. EVANS, former assistant plant manager of *Firestone Tire and Rubber Co.*, Noblesville, Ind., joins *Arrowhead Rubber Co.* as works manager at its Downey plant.

Pacific International Products, Inc., names GEORGE R. POSTLEWAIT as vice president.

Postlewait

W. T. Box

WILLIAM T. BOX is promoted to position of executive assistant on general office staff of *BJ Service, Inc.* Box has been employed by *Byron Jackson Co.* for about 12 years, and has been in charge of research and development work on the jet process of oil-well perforating during the last three years.

REAR ADMIRAL WILDER D. BAKER, USN (Retired), former Commandant, Eleventh Naval District, joins *Solar Aircraft Co.* as a consultant to the president. NORMAN PINTCHUK comes to Solar from *International Harvester Co.*, Chicago, as foundry metallurgist in the firm's stainless steel foundry.

H. DARWIN KIRSCHMAN, PHD., California Institute of Technology (1929), joins technical staff of *Truesdail Laboratories, Inc.* of Los Angeles as a research chemist. He is a former chemistry lecturer at University of California at Los Angeles.

Standard Oil Co. of Calif. promotes KENNETH H. SHAFFER to vice president of *The California Co.*, a subsidiary. C. W. GIBBS, manager of Standard's producing department's northern district, succeeds Shaffer as assistant general manager of the producing department. W. A. EARDLEY, chief petroleum engineer, will take over Gibbs' former post in Taft, Calif.

PAUL G. DUNMIRE, assistant factory superintendent and research engineer, *Fairbanks-Morse Co.*, joins *Smith-Blair, Inc.*, South San Francisco, as industrial engineer.

CHARLES F. BANNAN, vice president of *Western Gear Works* and *Pacific Gear & Tool Works*, is appointed industry specialist to gear and drive section of Mechanical Transmission Branch of the National Production Authority.

Frank Harkins, chief welding engineer, Solar Aircraft Co., San Diego, demonstrates a buttwelder built by Solar to Francis H. Stevenson (center), welding engineer of Aerojet Engineering Corp., and *Bernard Gross*, director of laboratories at Rohr Aircraft Corp. These two visitors were among 100 Southern California welding engineers, members of the Aircraft and Rocketry Panel of American Welding Society, who toured Solar to inspect that company's extensive welding facilities.

Kaiser Gypsum Co. promotes GEORGE QUIST to post of assistant to vice president and general manager. He was assistant manager of *Gypsum Carrier, Inc.*, a subsidiary, prior to this advance.

New Manager of Purchases for *Soulé Steel Co.*, San Francisco, is GEORGE S. FORD.

HAROLD HAYES, dean of engineering at California State Polytechnic College is appointed to national committee of *American Society of Refrigerating Engineers.*

T. J. WADE succeeds P. D. DEGNAN as personnel manager at *Western Waxed Paper Co.*, San Leandro. Degnan has taken on new duties with *Crown Zellerbach Corp.*, the parent company.

Crown Cork & Seal Co., San Francisco, names DON PENZOTTI as personnel manager. Penzotti was formerly personnel manager at *Soulé Steel Co.*

New vice president in charge of industrial relations for *Union Oil Co. of Calif.* is W. C. STEVENSON, former assistant executive vice president for industrial relations.

Pioneer Rubber Mills, Pittsburg, names EDWARD M. BALL as manager of industrial relations.

M. EARL MCCLENDON succeeds J. H. DORAN as manager of industrial relations at *California Packing Corp.'s* California Canned Foods Division.

C. R. HOGREFE promoted from mill superintendent for *San Joaquin Cotton Oil Co.*, Bakersfield, to general mill superintendent at Los Angeles, with jurisdiction over Bakersfield, Chowchilla, Phoenix and Mexicali plants. CARL STERNER upped from assistant superintendent to superintendent at Bakersfield.

Del-Air Products, Culver City, names JOSEPH F. ORSINI as assistant to general manager of its customer relations department. In this new capacity Orsini will help set up a new tooling program for Del-Air. Before joining the firm, he was purchasing agent and assistant to plant superintendent at *Aircraft Hydroforming, Inc.*, Hawthorne.

Orsini

Mober

THOMAS J. MOHER, former works accountant for *Bethlehem Pacific Coast Steel Corp.'s* West Coast Shipyards, is advanced to assistant to comptroller, Shipbuilding Division. F. M. KNOTT, chief clerk for San Francisco yard, becomes works accountant for West Coast Yards. L. A. BETTENCOURT, assistant to works accountant, succeeds Knott.

W. HARLOW WAGGONER, *Santa Clara Packing Co.*, San Jose, is elected president and general manager, succeeding NORMAN L. WAGGONER, deceased.

P. S. WILLARD, superintendent of process and production divisions at *Procter & Gamble Co.'s* Ivorydale, Ohio plant, will be superintendent of company's new plant at Fruitridge and Power Inn Roads, Sacramento.

JOHN XITCO is named manager of *French Sardine Co.'s* subsidiary. *High Seas Tuna Packing Co.*, San Diego. Xitco, formerly plant superintendent, succeeds DONALD LOKER who is transferred to French's Terminal Island plant for an administrative post.

JOSEPH M. TRICKETT is appointed to newly created position of associate director of management education study, American Management Association. EDWARD J. KELLY succeeds Trickett as dean of school of management at Golden Gate College, San Francisco.

Dalmo Victor Co., San Carlos, names ALBERT F. SCHWARZ as financial vice president. Schwarz was assistant treasurer and controller of *California Wine Association* before this appointment. E. L. WICKERSHAM joins Dalmo Victor as supervisor of its new machine accounting department.

A. H. BLOUNT, former assistant to president, *Tea Garden Products Co.*, San Leandro, assumes post of general manager, W. L. STUTTAFORD, vice president and general sales manager resigns.

Consolidated Freightways ups O. C. BENNETT to position of secretary-treasurer. He has been assistant to the president since 1938, and was elected secretary of the firm in 1950.

Pacific Airmotive Corp., Burbank, makes the following personnel appointments: RICHARD M. ROBINSON, purchasing agent; J. E. GILMORE, safety engineer; LEONARD J. PLATT, wage and salary administrator; and CHARLES E. TEMPLE, assistant contract administrator.

GEORGE CHALMERS is promoted to executive assistant to head of *Northrop Aircraft, Inc.'s* Special Weapons division. He was staff assistant and assistant administration director, prior to his new appointment. ROBERT B. WEAVER is appointed assistant director of missile development.

Colorado

SAMUEL S. AUCHINCLOSS, director of operations at *American Machine & Foundry Co.'s* Colorado Springs plant, is upped to executive vice president of *DeWalt, Inc.*, subsidiary of American Machine & Foundry Co., Lancaster, Pa.

Auchincloss

GILBERT C. HOOVER, retired Navy rear admiral, is named field supervisor of Atomic Energy Commission's Rocky Flats plant near Denver.

Mountain State Telephone & Telegraph Co. names WALTER K. KOCH as president. Koch, who was operating vice president prior to this pomotion, succeeds FLOYD P. OGDEN. RALPH L. HELMREICH succeeds Koch.

Idaho

JOSEPH C. KIEFFER, Kellogg, resigns as general manager of *Spokane-Idaho Mining Co.* to accept position as manager of operations of *American Smelting & Refining Co.* in Coeur d'Alene district.

New Mexico

EDWIN D. MURRAY is new utilities engineer in Community Management Division, Los Alamos Field Office, Atomic Energy Commission. RALPH P. JOHNSON, manager of the Los Alamos Field Office, returns to Santa Fe Operations Office of Engineering and Construction as deputy director. FRANK C. DILUZIO, director of community management at Los Alamos, becomes Los Alamos field manager; and PAUL A. WILSON, director of division of engineering and construction at Los Alamos, is new director of community management.

E. C. PHILLIPS, El Paso-New Mexico manager, becomes general manager in New Mexico for *Mountain States Telephone & Telegraph Co.* V. H. NACHTRIEB is now New Mexico commercial manager.

Oregon

LEROY M. SHANAMAN, Portland, is named chief of Inorganic and Agriculture Chemicals Branch of Chemical Division of National Production Authority. Shanaman is on leave from his position as sales manager of *Pennsylvania Salt Manufacturing Co. of Washington.*

Utah

U. S. Smelting, Refining and Mining Co. elects RICHARD N. HUNT as vice president. Hunt was chief geologist before this assignment.

J. B. ROSENBAUM, engineer in charge of chromium section and manganese concentrator at the electrometallurgical branch of U. S. Bureau of Mines in Boulder City, Nev., is transferred to Bureau of Mines branch in Salt Lake City.

DONALD R. JENKINS, application engineer in electric utility department of *Westinghouse Electric Corp.'s* Salt Lake City office, is appointed manager of gas turbine application engineering section of the company's Steam Division, Philadelphia, Pa.

J. W. RIBOTTO, general mill foreman at the Arthur mill of *Utah Copper Division, Kennecott Copper Corp.*, is named metallurgical engineer at Magna mill, succeeding C. G. WILLIAMS, retired. JOHN L. MOORE, grinding and flotation foreman, becomes general mill foreman at the Arthur mill. He is succeeded by ELMER C. SPEERS, experimental engineer at the Magna plant.

U. S. Smelting, Refining and Mining Co., Western operations, lists following promotions within ranks: R. A. PALLANCH becomes consultant on milling and metallurgy; C. A. NELSON is advanced to general superintend-

ent of Midvale plant, including milling and smelting; ARCHIE A. NELSON is made mill superintendent at Midvale; F. J. MARSHALL is named assistant smelter superintendent, and ALLAN C. VAUGH becomes assistant director of company's research laboratory.

Washington

ALBERT G. NATWICK, Washougal, on leave from *Crown-Zellerbach Corp.*, Camas, is appointed director of the Pulp, Paper and Paperboard Division of National Production Authority.

GEORGE R. PROUT, vice president and general manager at *General Electric Co.'s* Hanford Works, is placed in charge of nucleonics and atomic products with headquarters in Schenectady, N. Y. WILFRID E. JOHNSON assistant general manager, is upped to general manager. DENNIS W. PEARCE replaces CARL C. GAMERTSFELDER as manager of Biophysics Section in Radiological Sciences Department. Dr. Pearce was assistant to the manager at the Technical Section before this promotion. Dr. Gamertsfelder is transferred to a new position with Aircraft Nuclear Propulsion Division of the company at Lockland, Ohio.

The Simpson Logging Co., Shelton, names PAT REITEN as general safety supervisor for its Washington and California plants. Reiten was formerly chief of safety education for State Department of Labor.

Douglas Fir Plywood Association, Tacoma, names W. E. DIFFORD, Seattle, as managing director. Difford is owner of plywood and lumber sales and market development company at Seattle, known as *W. E. Diford & Sons, Inc.*

J. M. White (right) president Long-Bell Lumber Co., Longview, Wash., addresses Northwest Engineering Centennial held at Portland, Ore., August 9, 1952, on "Engineering Helpfulness for Forest Product Industries." *Fred O. McMillan* (left) national president of American Institute of Electrical Engineers and head of Electrical Engineering Dept., Oregon State College, was moderator for session.

Wilfrid E. Johnson (left), general manager, Neucleonics Division, General Electric Co., Hanford Works, Richland, Wash., addresses the noon luncheon of the Northwest Engineering Centennial, held at Portland, Ore., August 9, 1952, on "The Social and Political Impact of the Atomic Industry." *Thomas R. Miles* (right) Consulting Engineer, Portland, Oregon, was toastmaster.

ASSOCIATIONS ELECT

American Society of Tool Engineers, newly organized Santa Clara Valley chapter: Chairman, V. E. DIEHL, inspection supervisor of U. S. Navy, Campbell; first vice chairman, W. C. LANYON, manufacturing engineer, *Westinghouse Electric Corp.*, Los Gatos; second vice chairman, E. F. ROSKOWSKI, tool engineer, *Food Machinery and Chemical Corp.*, Santa Clara; secretary, G. B. RANDOLPH, *Republic Supply Co.*, San Jose; treasurer, R. D. HARPER, tool engineer, *Hiller Helicopter Corp.*, Woodside.

Newly organized San Fernando chapter: Chairman, ARTHUR D. LEWIS, *Art Lewis Production Equipment Co.*, Glendale; first vice chairman, RUDOLF REGEN, chief engineer, *General Machine Works*, Los Angeles; second vice chairman, RUDOLPH H. POWROZNIK, standards engineer, *Lockheed Aircraft Co.*, Burbank; secretary, R. A. BENTON, co-owner, *B & M Engineering Co.*, Burbank; treasurer, K. C. KERSEG, tool engineer, *Enders Engineering*, Pasadena.

Industrial Bag & Cover Association: Vice president, S. G. YOUNT, president, *Southland Paper & Converting Co.*, Los Angeles.

Western TRADE WINDS

News about those who distribute and sell industrial equipment and materials

ROBERTSON B. CLARK, former Pacific Coast regional sales manager for *Mallinckrodt Chemical Works,* is transferred to St. Louis, Mo., (home office) as divisional sales manager. MAURICE F. SCHMIDT, operations manager Los Angeles warehouse and office, succeeds Clark; and R. D. TWOMEY, Southern California sales representative, becomes pharmaceutical chemical sales manager in that area.

M. F. Schmidt

JAMES H. FITZPATRICK, former sales engineer for *BJ Service, Inc.,* chemical cleaning firm, is promoted to district superintendent of company's Oakland district, which provides marine and industrial chemical service to San Francisco and Oakland Bay area and northward through Oregon and Washington. Oakland office is located at 1401 Middle Harbor Road.

Pacific Metals Co., Ltd., San Francisco, Los Angeles, San Diego and Salt Lake City, has taken on distribution of Silvaloy brazing alloys and APW fluxes, manufactured by *The American Platinum Works,* Newark, N. J.

J. O. Ross Engineering Corp. opens an office at 823 Skinner Bldg., Seattle 1, Wash. K. H. JONES will be in charge of new branch and will supervise design and installation of company air systems, industrial ovens, dryers and heaters.

American Wheelabrator & Equipment Corp., Mishawaka, Ind., names WALTER S. SCHAMEL as district manager at Los Angeles. He will open offices at 3155 Leonis Blvd., Vernon.

Lufkin Foundry and Machine Co., Lufkin, Tex., manufacturer of oil field equipment, is celebrating its 50th anniversary. Western offices and warehouse were established in Los Angeles 25 years ago. Lufkin is represented by *Adams-Hill Co.* in San Francisco.

New West Coast sales and service operations for *The Denison Engineering Co.,* Columbus, Ohio, manufacturer of oil hydraulic equipment, are located at 565 North Prairie St., Hawthorne, Calif. WILLIAM D. PETERS is branch manager and VICTOR P. PREIDIS is sales engineer.

ROBERT R. WILLIAMSON, formerly of *Stevens Institute of Technology,* joins staff of *Librascope, Inc.,* 1607 Flower St., Glendale 1, Calif. In his new post, Williamson will direct an advanced digital computer program under way at Librascope.

Farr Co., Los Angeles manufacturer of filters and air filtration equipment, appoints ROBERT S. BEBB as division sales manager, Western division, and JAMES E. MATUSKA as Northwest district sales manager.

Alignment Instrument Associates, Hollywood, Calif., now represents *Joel Fox Co., Inc.,* Los Angeles producer of Align-A-Scope optical tooling instruments, in 11 Western states.

Norris-Thermador Corp. appoints ROD MASTICK cylinder sales manager, Western area (Los Angeles) and JAMES S. LOCKHEAD manager of plumbing sales, for Southern California.

Latchford Marble Glass Co. forms two new subsidiary sales organizations, *Latchford Marble Package & Supply Co.,* Los Angeles, and *Latchford Marble Container and Supply Co.,* with offices in San Francisco and Fresno. JOHN B. MCCANDLESS is president of Latchford Marble Package & Supply Co., and WILLIAM SIMKINS, vice president and sales manager for the parent company, is executive vice president. Officers of Latchford Marble Container and Supply Co. include Simkins as president and McCandless as vice president; and W. B. MARBLE, JR., and E. E. BALLING as secretary and treasurer respectively of both new companies. FRANK A. TOSO is in charge of sales in San Francisco territory, and CLARENCE COULTER in the Fresno area. KENNETH HOFFMAN and RALPH D. FORSMAN handle glass and supply orders in the San Francisco office.

Simkins

McCandless

DICK LEWIS is appointed district representative at Kansas City, Mo., for *The Frank G. Hough Co.,* Libertyville, Ill., and will cover the Western states of Wyoming, Colorado and Nebraska.

THOMAS A. HARVEY, newly appointed Western regional manager for *Cullman Wheel Co.,* establishes offices 418 North Glendale Ave., Glendale 6, Calif. He will cover the states of California, Arizona and Nevada.

Central Scientific Co. moves to a new office building at 1040 Martin Ave., Santa Clara, Calif.

The Flox Co., Inc., distributor of *Nalco* chemicals, moves from 1132 N.W. Glisan St. to 5329 N.E. Union Ave., Portland 11, Ore. Telephone: GArfield 0276.

TRANSOCEAN AIR LINES executive vice president, Samuel L. Wilson, seated, is signing a contract which establishes Talchem, Transocean subsidiary as United States and foreign distributor for products of Wyandotte Chemicals Corp. Standing are: (left) Lloyd F. Coates, general manager of Talchem, and P. S. Spencer, district sales manager of J. B. Ford Division of Wyandotte Corp.

C. B. Hunt & Son, Inc., Salem, Ohio, manufacturer of air and hydraulic control valves appoints three new Western representatives as follows: *Circle Seal Supply Co.*, 2181 E. Foothill Blvd., Pasadena, Calif., for Southern California territory; *Process Equipment Co.*, 1663 Central St., Denver, Colo., for Colorado, Wyoming and parts of Montana and New Mexico; and *Pollard and Co.*, South 121 Madison St., Spokane, Wash., for eastern Washington and parts of Idaho.

Allegheny Steel Band Co., Pittsburgh, Pa., manufacturer of steel strapping and accessories, names R. D. Loesby district sales manager of firm's new Seattle sales office.

Hydraulic Power & Equipment Co., Portland, Ore., is named distributor for O-ring seals manufactured by *The Parker Appliance Co.*, Cleveland, Ohio.

Roberts Motor Co., Portland, Ore., forms a new firm, *Truck and Industrial Equipment Co.*, to carry and service a full line of truck and industrial equipment, including Bendix-Westinghouse air brake and Waukesha Motor products. Floyd Chapman will be manager of Truck and Industrial Equipment Co. He will be assisted by Paul Rabbach. Pending completion of Roberts Motor's building at 123 Pacific Ave., both firms will be housed at 7 N.E. Oregon St.

The Bellows Co. of Calif. names Clifford S. Vaughn as assistant to manager. Vaughn was field engineer in Los Angeles territory prior to this advance.

Joseph Whitwell, 917 East Baseline Rd., Claremont, Calif., is designated as engineering sales representative in the California area for *Micro Metallic Corp.*, Glen Cove, N. Y.

Frank L. Parker becomes director of sales development and public relations for *Plexolite Sales Co.*, Los Angeles. *Fiberglas Engineering & Supply Co.* is appointed Northern California distributor for Plexolite Sales Co.

Waco-May Co., Los Angeles, West Coast licensee manufacturer and distributor of Waco equipment, grants *Waco Scaffolding Co.*, 535 E. Channel St., Stockton, Calif., exclusive distribution rights in Stockton-Merced area for sectional steel scaffolding equipment manufactured by *Wilson-Albrecht Co., Inc.*, Minneapolis, Minn. Sam Wallach is appointed general manager of new Stockton firm.

David W. Jones, Jr., sales representative for tubular products division of *The Babcock & Wilcox Co.*, Beaver Falls, Pa., opens new offices in Goby Bldg., 1321 Bannock St., Denver, Colo. Jones handles division's complete line of seamless and welded, carbon, alloy and stainless steel tubing in Rocky Mountain area.

U. S. Hoffman Machinery Corp., Syracuse, N. Y., appoints the following firms as engineering representatives for its industrial filtration division products: *Burson Sales*, 4942 Colorado Blvd., Denver, Colo.; *Clarence Silver Co.*, 550 West 7th St. So., Salt Lake City, Utah; *Thomas S. Wood*, 220 9th Ave. N., Seattle 9, Wash.; *Dawson Machinery Co.*, 5700-4 First Ave. So., Seattle, Wash.; *Belilove Co.*, 420 Market St., San Francisco, Calif.; *Chester Paul Co.*, 1605 Victory Blvd., Glendale, Calif.

New West Coast office of *Tocco Division* of *Ohio Crankshaft Co.*, Cleveland, Ohio, is located at 3349 Union Pacific Ave., Los Angeles. Under management of Harlan A. Messner, complete engineering, sales and service facilities for Tocco induction heating equipment are now available to West Coast industry.

Continued on page 106

Continued from page 105

Quaker Rubber Corp., division of *H. K. Porter Co., Inc.*, Pittsburgh, Pa., opens a new Pacific Northwest regional factory warehouse and offices in Portland, Ore. MILTON L. CLARK, Philadelphia, is assigned duties as regional manager.

W. N. CUNNING is new Northern California representative for *Photoswitch, Inc.*, manufacturer of industrial electronic and photoelectric controls. His office is located at 7 Front St., San Francisco.

D. W. SEAGRAVE is new regional service supervisor for *Allis-Chalmers Manufacturing Co.'s* Pacific region, with headquarters in San Francisco. RICHARD H. NICHOLSON takes over as sales representative in the San Francisco district office.

Industrial Electric Service Co., Inc., Crescent City, Calif., is appointed as a distributor for Allis-Chalmers general machinery division.

Westinghouse Electric Corp, names ROBERT W. MCLEAN as Pacific Coast market development representative. McLean, who will headquarter in San Francisco, joined Westinghouse in 1949. THOMAS O. WHITTAKER is appointed Northern California district apparatus and supply sales promotion manager, with headquarters in San Mateo.

ROBERT F. WHITE is promoted to Western division parts representative for *Caterpillar Tractor Co.* White joined Caterpillar in 1939.

ROY BACKMAN, former general sales manager of *Western Airlines* and more recently vice-president in charge of sales and traffic for *Alaskan Airlines*, takes over as sales manager-products for *Pacific Airmotive Corp.*, Burbank. Backman, who will also

Keller *Backman*

act as advertising manager, joined Pacific Airmotive Corp. three months ago as sales division consultant. GEORGE T. KELLER, former manager-customer service department, is advanced to sales manager-maintenance.

JOHN R. MORRILL becomes a partner and general manager of *Gibson Welding Supplies* and *Inland Oxy-Acetylene Co., Inc.*, Spokane, Wash. Morrill was vice president of *Baker Raulang Co.*, Cleveland, prior to assuming these new duties.

H. W. ROBERTS, *Roberts Motors*, Portland, establishes *Truck & Industrial Equipment Co.* to carry a full line of truck and industrial parts, equipment, and supplies, including those manufactured by *Westinghouse Electric Co.* FLOYD CHAPMAN is manager and PAUL RABBACH is assistant manager.

The Cold Metal Products Co. of Calif., Los Angeles, appoints LEONARD W. RENK as head of its sales and spring steel department. Renk was formerly associated with *Precision Steel Warehouse*, Chicago.

McCulloch Motors Corp., Los Angeles, names ALLEN A. HARRIS as sales engineer.

Harris *Nelson*

M. C. NELSON is advanced from general manager to vice president of *Barksdale Valves*, Los Angeles.

Grether & Grether, Stockton, Calif., is manufacturer's representative for *Reliance Division* of *Eaton Manufacturing Co.*, Massillon, Ohio, in the states of Idaho, Nevada, Arizona, Utah, New Mexico, Colorado, Wyoming, Montana, North and South Dakota. Firm will handle sales and services for Reliance lock washers, Springtites and Sems, snap bearing locks and retainer rings.

Marine Engineering & Supply Co., Los Angeles, is purchased by *Owens-Corning Fiberglas Corp.'s* San Francisco subsidiary, *Fiberglas Engineering & Supply Co.* This Los Angeles company will become marine engineering division of Fiberglas Engineering & Supply Co.

ELLSWORTH R. FLETCHER, power and sales representative, *Portland General Electric Co.*, Portland, Ore., becomes industrial sales engineer, replacing JOHN D. SCOTT, who takes up special duties for the firm.

Petley Inc., 5424 E. Slauson Ave., Los Angeles industrial and automotive equipment engineers, make three major executive changes. WILLIAM K. PETLEY, elected vice president and director, will also supervise kitchen cabinet sales for Southern California and Arizona district. RAY SMITH takes over southwest Los Angeles territory of industrial sales division (including Long Beach, Torrance, El Segundo, Wilmington and San Pedro). HENRY C. BECKER becomes manager of automotive sales for Southern California district.

DONALD JORDAN becomes office manager for *Jantzen Knitting Mills, Inc.*, Portland, Ore.

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Two Series 70 Model 6657 Ross Straddle Carriers 54 x 54", each with operator's cab and steering wheel guards and F6209 Continental motor; and two Model 16 HT Ross Lift Trucks with 24' Lift, 54" forks, adjustable side-shifting carriage, operators guard, with all standard equipment otherwise added.

Machines in splendid shape—now being used regularly, available because of our switching of stacking package standards.

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Century Electric Geared Motors, Parallel Shaft

H.P.	Motor RPM	Shaft RPM	Phase	Price of each
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½	1750	60	Single	118.30
¾	1750	125	Single	118.30
¾	1750	84	Single	128.70
¾	1750	60	Single	145.00
½	1750	125	Three	97.20
¾	1750	125	Three	114.40
¾	1750	60	Three	115.70
1½	1750	45	Three	253.50

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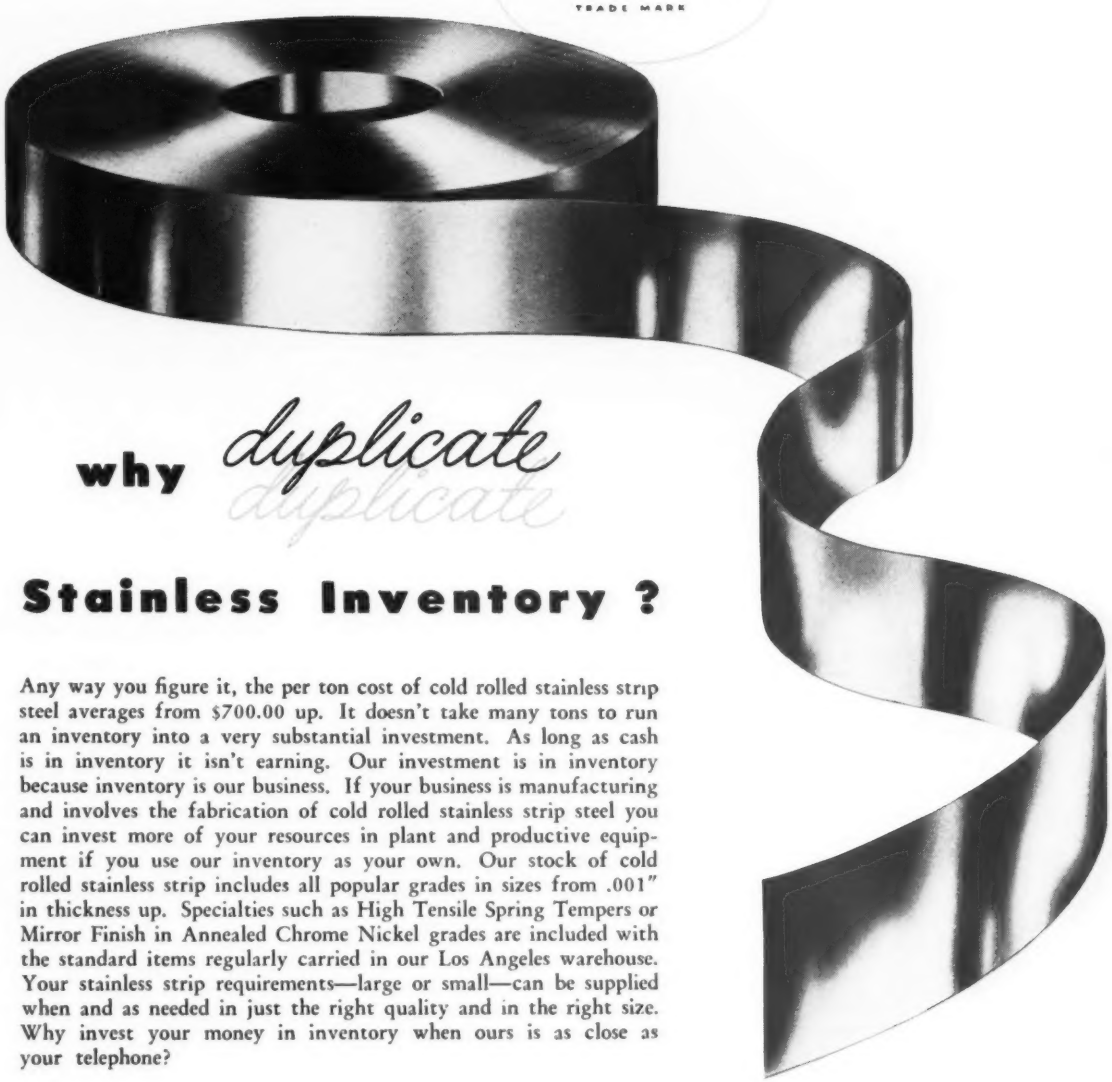

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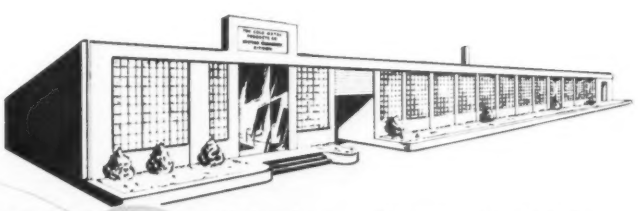

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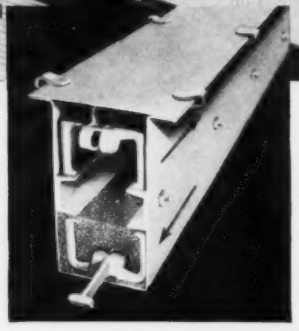

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